THE

ELEMENTS

OF

MATERIA MEDICA;

COMPREHENDING

THE NATURAL HISTORY, PREPARATION, PROPERTIES, COMPOSITION, EFFECTS, AND USES

OF

MEDICINES.

PART II.

CONTAINING

THE VEGETABLE AND ANIMAL MATERIA MEDICA.

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LONDON:

LONGMAN, ORME, BROWN, GREEN, AND LONGMANS.

1840.

TO

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&c. &c. &c.

The Second Part of this Work is Dedicated,

AS A TESTIMONY OF

ADMIRATION OF HIS BRILLIANT TALENTS AND EXTENSIVE BOTANICAL ACQUIREMENTS,

BY HIS OBLIGED FRIEND,

THE AUTHOR.

PREFACE.

In presenting the Second Part of this Work to the Public, I beg to return my best thanks to those kind friends who have, on several occasions, rendered me their aid in its execution. In drawing up the Historical and Bibliographical Table, it is but justice that I should acknowledge the assistance which I have received:—In the Hindoo Department, from my friend, Professor Royle; in Scandinavian Pharmacological Literature, from Dr. Holst, Professor in the University of Christiana, and in the American Department, from Dr. Wood, Professor of Materia Medica and Pharmacy in the University of Pennsylvania,—to all of whom my best thanks are justly due.

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OF

THE HISTORY AND LITERATURE

OF THE

MATERIA MEDICA.

1. WORKS ON THE HISTORY OF MEDICINE GENERALLY.

Le Clerc (Dr. D.). *Histoire de la Médecine.* Gen. 1696. 4to; à la Haye 1729. (Brought down to the time of Galen. An Engl. transl. by Drs. Drake and Baden, 8vo. Lond. 1699).

Freind (Dr. J.). *The History of Physick from the time of Galen to the beginning of the sixteenth Century.* 2 vols. 8vo. Lond. 3rd ed. 1727.

Schulze (Dr. J. H.). *Historia Medicinæ a rerum initio ad annum urbis Romæ* DXXXV. *deducta.* Lips. 4to. 1728.

Ackermann (Dr. J. C. G). *Institutiones Historiæ Medicinæ.* 8vo. Norimb. 1792.

Sprengel (Kurt). *Histoire de la Médecine depuis son origine jusqu'au dix-neuvième siècle.* Trad. de l'Allemand par A. J. L. Jourdan. Paris. 9 vols. 8vo. 1815—20.

Choulant (Dr. D. L.). *Tafeln zur Geschicte der Medizin.* Leipzig. 1822. fol.

Hamilton (Wm.). *The History of Medicine, Surgery, and Anatomy, from the Creation of the World to the commencement of the nineteenth Century.* 2 vols. small 8vo. Lond. 1831.

Bostock (Dr. J.). *History of Medicine,* in the *Cyclopæd. of Pract. Med.* Vol. 1.

Broussais (Dr. C.). *Atlas Historique et Bibliographique de la Médecine, ou Histoire de la Médecine.* Paris. 1834. fol. (A translation of Choulant's Tables, with additions to some of them.)

2. WORKS CONTAINING A SPECIAL HISTORY OF PHARMACOLOGY.

Cullen (Dr. Wm.). *Treatise of the Materia Medica.* 2 vols. 4to. 1789.

Voigtel (Dr. F. G.). *Vollständiges System der Arzneimittellehre.* 2 vols. 8vo. 1816—17.

Choulant, op. supra cit.

Bischoff (Dr. C. H. E.). *De Lehre von den chemischen Heilmitteln oder Handbuch der Arzneimittellehre.* 3 vols. 8vo. Bonn. 1825—31.

Broussais (Dr. C.). Op. supra cit. (Choulant's Table in French, without additions.)

EGYPTIAN MEDICINE.

THOUT or THAUT (also called Hermes or Mercury) regarded as the founder of Medicine.

Medicine practised first by priests, afterwards by physicians who confined themselves to the study of one disease. (Herod. *Euterpe* LXXXIV).

The sick exposed in public places (*Strabo*).

Purges, vomits, and clysters, used for three days successively in every month. (Ibid LXXVII). Dietetical regulations: the hog regarded as unclean. Baths and unguents.

Worshipped a bulbous plant (Κρόμμυον; *Squilla?*) to which they erected a temple (Pauw).

Employed *aëtites*, slime of the Nile, frictions with crocodile's fat in rheumatism, and mucilage of *semina psyllii*. Salt, νίτρον (carbonate of soda?), alum, plasters, and unguents; white lead and verdigris occasionally entered into the latter.

Fumigations with *Cyphi* (Κυφι) a mixture of various drugs. (Disocorides, i. 24).

1729 Spices, balm, and myrrh, carried to Egypt. (*Gen.* xxxvii. 25).

1689 Embalming practised. Palm wine, aromatics, myrrh, cassia, and other odorous substances, (not frankincense), as well as νίτρον (carb. soda?) and gum used in this process.

B. C.

☞ Consult,—PAUW (M. De), "Phil. Dissert. on the Egyptians and Chinese." vol. 1. p. 130. 1795. ALPINUS (Prosper), "De Medic. Ægypt."

HEBREW MEDICINE.

The infliction and cure of diseases on various occasions ascribed by the Sacred Historian to the direct interposition of God. (*Exod.* ix. 15. *Numb.* xii. 10.)

Remedial agents consisted principally in strict hygienic means. (Circumcision, dietetical rules, separation, ablution, combustion of infected garments. See *Gen.* xvii. 10; *Lev.* xi. & xiii.; 2 *Kings*. v.)

1491 Medicine practised by the Priests. (*Lev.* xiv.) Gold, silver, lead, tin, iron, and brass (copper?) mentioned by Moses.

1491 Odoriferous ointment and confection; the most ancient recipes on record. (*Exod.* xxx. 23—25, & 34—35.)

1063 Music employed as a remedy. (*Sam.* xvi. 16.)

884 Sesquisulphuret of antimony used as a face paint. (2 *Kings*, ix. 30).

713 Fig poultice. (2 *Kings*, xx. 7.)

600 Physicians (not priests) referred to. (*Jerem.* viii. 22.) N.B. The so called Egyptian physicians (*Genes.* L. 2) were probably ἐνταφιασταί, undertakers, or embalmers.

The following substances are referred to in the Bible: the Olive, Saffron, Barley, Wheat, the Fig, the Vine, Myrrh, Bdellium, Galbanum, Cumin, Coriander, Flax, Garlic, Balm of Gilead, Olibanum (Frankincense), Cassia, Cinnamon, the Almond, the Pomegranate, Dill (in our translation incorrectly called Anise)—Colocynth? Ricinus?

A. D.

40 Herod was let down into a bath of oil. (Josephus, *Bell. Jud.* lib. 1. cap. 33. § 5.)

Oil and wine applied to wounds. (*Luke*, x. 34.)

Various superstitious practices. (Adam Clarke *Comm.* Note to Mark, v. 26.)

☞ For further information respecting Hebrew medicine consult the "Bible";—J. H. Horne's "Introd. to the Crit. Study and Knowl. of the Holy Script. vol. iii. 8th ed. 1839;—K. Sprengel, "Analecta Historica ad Medicinam Ebræorum," Hal. 1796;—D. Carcassone, "Essai Historique sur la Méd. des Hébreux, anciens et modernes." 8vo. Montp. 1815.

B. C.

ASSYRIANS.

The Babylonians had no professors of medicine. They exposed their sick in public places, in order that passengers might communicate their experience as to the best mode of cure. (Herodotus, *Clio* cxcvii.) Extracted oil from the Sesamum. (Ibid. cxviii).

☞ Consult,—SMOLL (D. G.), "Venerandæ antiquitatis Assyriorum Chaldæorum, &c. Philosoph. Med. Regum et Princip. philosophica et Med. Principia." 4to. Lubec. 1609.

CHINESE MEDICINE.

Of its ancient state but little is known. The Chinese pretend that its study was coeval with the foundation of their empire, and that their medical code was the production of Hoangti, B. C. 2000. (Grosier.) Before the Christian era there was a constant communication between China and India. (*Asiat. Journ.* July, 1836).

A. D.

229 Medical science commenced with Chang-ka; for all works before that (said to be dated B. C. 1105 & 189) treat of medicine without giving prescriptions. (*Trans. of Med. Soc. of Calc.* i. 146). As the Chinese have retained their ancient manners and customs, we must judge of what their medicine was by what it is.

Pun-tsaou or (*Herbal*), the most considerable Chinese work on Materia Medica, includes minerals vegetables and animals. (Davies, ii. 278.)

Ching che chun ching, (*Approved marked line of Medical Practice*,) a celebrated work in 40 vols.; of which, eight are devoted to *Luy-fang* (*Pharmacology*). The articles of the Materia Medica are very numerous. Ginseng is their panacea. Aromatics and gums in apoplectic cases. Opium as an anodyne and in dysentery. Mercury both raw and oxidized. Musk, rhubarb, tea, camphor of the Dryobalanops, asafœtida, spices, larvæ of the silk worm, bones of tigers and elephants, vegetable wax, horns, fins, &c. Moxa. Croton Tiglium.

☞ Consult,—DU HALDE (J. B.), "Descript. Géogr. et Hist. de la China." t. 3. p. 318. 1770; GROSIER (L'Abbé), "Descript. Gén. de la China." t. ij. p. 466. 1787; DAVIES (J. F.), "The Chinese." vol. 2. p. 278; GUTZLAFF "Journ. of the Asiat. Soc." vol. 4. p. 154.

HINDOO MEDICINE.

1. *Ancient Medical Authorities and their Works.*

Date uncertain.—Cannot be later than the Ninth or Tenth Century, A.D. and probably much more ancient.

BRAHMA the Hindoo Deity; author of the *Vedas*, the most ancient books of the Hindoos, and next in antiquity to those of Moses. (Sir W. Jones, *Disc.* ix.).

Ayur Veda, the oldest medical writing of the Hindoos, forms a part of the 4th or *Atharva Veda* (the least ancient Veda). It is distributed into eight subdivisions. (See H. H. Wilson, *Calcutta Orient. Mag.* Feb. and March 1823; and Royle, *Essay*, p. 57).

DACHSA, the *Prajapati*, to whom Brahma communicated the Ayur Veda, instructed the two ASWINS or Sons of SURYA (the Surgical attendants of the gods).

According to some the Aswins instructed INDRA the preceptor of DHANWANTARI (also styled *Kasiraja*, prince of Benares); but others make ATREYA, BHARADWAJA, and CHARAKA, prior to the latter.

CHARAKA (*Sarac, Scarac, Scirah* or *Xarac*) mentioned by Serapion, Avicenna, and Rhazes. His work is extant, but not translated.

SUSRUTA, son of VISWAMITRA, was pupil of Dhanwantari and contemporary of RAMA. Treats chiefly of *Salya* and *Salekya* or Surgery, and divides medicines into locomotive (animals both viviparous and oviparous, and produced in moist places) and non-locomotive (plants and minerals). Gold, Silver, Arsenic, Mercury, Diamonds, Earths, and Pearls, are enumerated; also Heat and Cold, Light and Darkness, the increase and decrease of the Moon's age, as remedial means. Lithotomy, the Extraction of the Fœtus, Venesection. 127 weapons and instruments. Actual cautery. Alkaline caustics. Heated metallic plates. Leeches. Gourds used as cupping glasses. Astringent and emollient applications. Leaves, pledgets, threads, and bandages. Drastic and mild purgatives, emetics, diaphoretics, baths, and aspersions of water, Stimulants, Sedatives, Narcotics, and Acrid poisons all employed. Datura, Nux Vomica, Croton Tiglium, Myrobalans, &c. were adopted by the Arabs.

☞ SUSRUTA (The); or System of Med. taught by Dhanwantari and composed by his disciple Susruta. Vol. i. 8vo. Calc. 1835.

B. C.

2. *Early Translations from Hindoo Works.*

α. *Tamul*, by MAHA RISHI AGHASTIER, who is named in the *Ramayana*, the oldest Hindoo profane work, and which is supposed to have been revised by the poet Calidas in the reign of Vikramaditya, whose era commences B. C. 57. (For a classification of drugs in a Tamul work called the *Kalpastanum*, see Royle's *Essay*, p. 54.)

β. *Cingalese.* (See a list in Ainslie's *Mat. Ind.* vol. ii. p. 525; also Heyne's *Tracts on India*, p. 125—171).

γ. *Tibetan* made in the eighth century. (See Csoma de Körös, in *Journ Asiat. Soc.* iv. 1.) 715 substances are mentioned, most of which are indigenous in India.

3. *Antiquity of Hindoo Medicine.*

Cannot be determined by Hindoo chronology or authors: hence must be ascertained from other sources. The great antiquity of Hindoo Medicine is proved by the following circumstances:

α. *Indian products are mentioned in the Bible.* (Royle, p. 138). In early times commerce was established between India and Persia, Syria, and Babylon; also by the Persian and Arabian Gulphs with Egypt, &c.

β. *At a very early period India was peopled and in a high state of civilization.* (For proofs, see Royle, p. 150 to 179). As many chemical arts (e. g. distillation, bleaching, dyeing, calico printing, tanning, soap and glass making, manufacture of sugar and indigo,) were practised by the Hindoos, who were acquainted with, and their country contains, all the chemical substances mentioned by Geber, it is not improbable that they and not the Arabs originated Chemistry. The Grecian sages travelled in the East: hence the coincidences between the systems and discoveries of the Greeks and those recorded in Sanscrit works.

γ. *Indian products are mentioned by the Greeks and Romans.* (e. g. by Hippocrates, Theophrastus, Dioscorides, Pliny, Oribasius, Ætius, and Paulus). They were doubtless employed in the countries where they were indigenous before they were exported.

δ. *Ancient Inscriptions shew the Antiquity of Hindoo Medicine.* A medical edict by King Piyadasi, directing the establishment of depôts of medicines, and the planting of medicinal roots and herbs throughout his dominions and in the countries where Antiochus and his generals command. This, therefore, must have been issued and cut in rocks and metal pillars as early as B.C. 220.

ε. *The Persians translated Hindoo Works* A.D. 531 to 579. (Royle's *Essay*, p. 68).

ϑ. *Hindoo physicians were in high repute at the Court of Harum al-Rashid and Al-Mamoon, from* A.D. 786 to 850.

η. *The Arabian authors* (Rhazes, Serapion, Mesue, and Avicenna) *mention Charak, and quote from the Susruta.*

☞ Consult,—WILSON (H. H.), "Orient. Mag." Calc. 1823; and "Trans. Med. and Phys. Soc." Calc. vol. 1.; HEYNE (B.), "Tracts on India," Lond. 1814; AINSLIE (W.), "Mat. Ind." 2nd vol. Lond. 1826; DIETZ (F. R.), "Analecta Med." Lips. 1834; ROYLE (J. F.), "Essay on the Antiq. of Hindoo Med." 1837; GELDEMEISTER, "Scriptorum Arabum de rebus indicis loci et opuscula inedita." 8vo. Bonn. 1838.

GREEK MEDICINE.

1. *Before the time of Hippocrates.*

1398 MELAMPUS, a soothsayer and physician. Cured impotence by iron wine (Apollod. *Bibl.* Fr. transl. lib. i. cap. ix. p. 75); and madness by hellebore (Pliny, XXV. 21).

1270 CHIRON *the Centaur*, a physician and surgeon. Was cured of a wound by the *Centaurea Centaurium* (Ibid. XXV. 30).

1263 ÆSCULAPIUS or ASCLEPIAS, renowned for his medical and surgical skill. His sons MACHAON and PODILIRIUS also famous surgeons; the latter practised venesection.

1134 The first temple to Æsculapius founded.

ASCLEPIADEÆ descendants of Æsculapius and priests of his temples. Votive tablets suspended in the temples.

968 EURYPHON author of the Γνῶμαι Κνίδιαι or Cnidian Sentences.

907 } HOMER mentions the Papaver somniferum, νηπενθὲς (*Cannabis indica?* opium??), Moly (?), 884 &c.

617 ARISTÆUS discovered Silphium (see p. 1041).

5800—500 PYTHAGORAS employed Magic, Dietetics, Mustard, Anise, and Vinegar of Squills (Pliny XIX. 30).

2. *Hippocrates.*

460—to 360? HIPPOCRATES the "*Father of Medicine.*" Born at Cos. The 18th by his father from Æsculapius. Ascribes diseases to alterations of the humors (blood, pituita or phlegm, and yellow and black bile). An antipathic. Employed diet, baths, exercise, bloodletting (venesection, cupping, and scarification), the actual cautery, the knife, and a very extensive series of medicines. His materia medica includes:

1st. *Minerals*,—sulphur, lime, carbonate of soda, alum, common salt, oxide and carbonate of lead, acetate (and sulphate?) of copper, oxide of iron, and yellow and red sulphuret of arsenicum.

2ndly. *Vegetables*,—acacia, allium, ammoniacum, anethum, anisum, cardamomum, cassia, cinnamon, colocynth, conium, coriandrum, crocus, cuminum, cydonia, elaterium (?), euphorbia, fœniculum, galbanum, gallæ, glycyrrhiza, gnidium, helleborus, hyoscyamus, juniper, lactuca, laurus, linum, malva, marrubium, mastic, mentha, morus, myrrha, olea, opium, opobalsamum, opoponax, origanum, piper, pix, pulegium, punica, quercus, rosa, rubia, rumex, ruta, sambucus, sagapenum, scammonia, scilla, silphium, sinapis, staphisagria, styrax, turpentine, and veratrum.

3rdly. *Animals*,—Κανθαρὶς (Mylabris Füsselini?), castoreum, sepia, ova, cornua, mel, serum lactis, and cera.

☞ DIERBACH (Dr. J. H.). "Die Arzneimittel des Hippokrates." Heidelb. 1824.

3. *From Hippocrates to Galen.*

B. C.

380 ANCIENT DOGMATIC (*or Hippocratean*) SCHOOL (*Theory in Medicine*). 380. Founded by THESSALUS and DRACO (Sons of Hippocrates), in conjunction with POLYBIUS (their brother in law).——
354 354. DIOCLES CARYSTIUS (called the second Hippocrates), wrote on plants and dietetics. Gave a leaden bullet in ileus.——
341 341. PRAXAGORAS *of Cos* (the last of the Asclepiadeæ); vegetable medicines.——
336 336. CHRYSIPPUS *of Cnidus*, opposed bleeding and purging, and vegetable medicines.

304 *Alexandrian School.*——304. ERASISTRATUS (pupil of Chrysippus) opposed bleeding; used simple medicines.——307. HEROPHILUS *of Chalcedony*, a demi-empiric, used compound
285 and specific medicines.——285. Medicine divided into *Dietetics, Pharmacy*, and *Surgery*.

384—322 NATURAL HISTORIANS. 384—322 ARISTOTLE; wrote on Animals (also on plants and
371—286 pharmacy). 371—286. THEOPHRASTUS, the founder of botany.

290 EMPIRIC SECT (*Experience the sole guide*)—290 founded by PHILINUS *of Cos* (disciple of
240 Herophilus).——240 SERAPION of Alexandria.——
230 230. HERACLIDES *of Tarentum* ("*Prince of Empirics*") used conium, opium, and hyoscyamus, as counter-poisons.
140 NICANDER *of Colophon*, wrote on poisons and antidotes: his Θηριακὰ and Ἀλεξιφάρμακα still extant.
135—63 ——135 to 63. MITHRIDATES; his supposed antidote (*Mithridatium Damocratis*) contained
158 54 substances.——158. ZOPYRUS employed a general antidote (*Ambrosia*); classified medi-
138 cines according to their effects. CRATEVAS a botanist.——138. CLEOPHANTUS described medical plants.

160 *Gentian* first used by Gentius, king of Illyria.

100 METHODIC SECT.—100 ASCLEPIADES *of Bithynia* rejected all previous opinions, and termed the Hippocratean system "*a meditation on death.*"——63. THEMISON *of Laodicea*, pupil of Asclepiades, founder of the sect. Explained all physiological and pathological doctrines by the *strictum* and *laxum* of the organic pores, and regarded all medicines as astringents or relaxants. Employed leeches.

A. D.

54? DIOSCORIDES (Pedacius). The most renowned of all the old writers on Materia Medica. His work is the best (of the ancient ones) on the subject, and for 1600 years was regarded as the first authority. "In him I counted about 90 minerals, 700 plants, and 168 animal substances, that is 958 in all, without reckoning the different simples the same substance often affords." (Alston, *Lect.* i. 15). Dr. Sibthorp visited Greece for the purpose of studying on the spot the Greek plants of Dioscorides. (*Flora Græca;* and *Prodr. Fl. Græcæ*, by Sir J. E. Smith).

A. D.	GREEK MEDICINE—(*Continued.*)
131—200	GALEN (Claudius) a brilliant genius of vast erudition and rare talents. Explained the operation of medicines by reference to their elementary qualities (heat, cold, dryness, and moisture), of each of which he admitted four degrees. This doctrine was held in the schools until the time of Paracelsus.
	4. *From Galen to the fall of the Greek School.*
	(Minor Greek Authors.)
360	ORIBASIUS.
550	AËTIUS. Employed musk medicinally.
560	ALEXANDER TRALLIANUS. First mentions rhubarb. Notices hermodactyl. Used mild laxatives.
600 / 700	PAULUS ÆGINETA. First notices the purgative properties of rhubarb. Distinguishes between *Rha* and *Rheon.* Describes the effects of hermodactyl.
1034	SETH (Simeon). Notices camphor.
1100 / 1300	ACTUARIUS (John). Mentions capsicum (κάψικον).
1300 ?	MYREPSUS (Nicholas).

ROMANS or ITALIANS.

A. D.	
	In the early periods of Roman History medicine was practised by slaves and freedmen.
23	MENECRATES. Employed escharotics. Invented Diachylon plaster.
13—55	CELSUS (A. Cornelius). *De Medicina.* A methodist? An elegant writer. Lays down hygienic rules. Distinguishes foods according to the degree of their nutritive power and digestibility. His remarks on these subjects, as well as on the use of remedial agents generally, display great judgment. Speaks of the use of nourishing clysters, gestation, baths, frictions, &c. Employed in dropsy frictions with oil.
41	SCRIBONIUS LARGUS. An empiric. His work (*Compositiones Medicæ*) is the first pharmacopœia known.
23 79	PLINY the Elder (Caius). A natural historian. In his work (*Historia Naturalis*) he has collected all that was known in his time, of the arts, sciences, natural history, &c. He displays prodigious learning and a vast fund of erudition. In botany and materia medica he has copied almost verbatim the remarks of Theophrastus and Dioscorides.
230	CÆLIUS AURELIANUS. A methodist. The only one of this sect whose works have descended to us.

PERSIAN MEDICINE.

B. C.	
1491	Must be very ancient, but its history scarcely known. Products of Persia (ex. galbanum, asafœtida, sagapanum, &c.) mentioned in the Bible or by Hippocrates: it is to be presumed that the Persians knew the medical qualities of their indigenous drugs, previous to selling them.
400	Ctesias of Cnidus physician for seventeen years to Artaxerxes Mnemon.
A. D. 272	Dschondisabour (Jondisabur or Nisabur) founded. Greek physicians sent by the Emperor Aurelion.
	ALMANZOR, the second Caliph of the house of Abbas, a great encourager of the sciences and medicine.

ARABIANS.

A. D.	
767	Bagdad built. The sciences munificently patronized by the Caliphs. A college formed. Hospitals and dispensaries established.
	Schools of Damascus and Cordova.
	The doctrines of Hippocrates and Galen taught. Mild laxatives (as cassia, tamarinds, manna, rhubarb, and senna,) substituted for drastics. Chemical medicines mentioned. Various pharmaceutical preparations (syrups, juleps, conserves, loochs, robs, and distilled waters and oils) contrived. Dispensatories published.
622	AARON or AHRON (*The Pandects*).
Died 872	EBN-SAHEL (Sabor) *Krabadin,* the first dispensatory.
Died 880	ALKHENDE (J.). Wrote on the proportion and doses of medicines.
Born 702	GEBER, "The Patriarch of Chemistry." Mineral acids, alkalies, and many alkaline and metallic salts, are noticed by him. (See *Hindoo Medicine.*)
Died 846 / 865	MESUE (John). *De simplicibus et de electuariis.*
900 / 742 / 1066	SERAPION (John, jun.). *De simplicibus medicinis.*
	ABN GUEFITH or ABHEN GNEFITH. *De simplic. medicam. virtut.*
852 to 932	RHAZES. *De simplicibus medicinis.* One of the most celebrated Arabians. Employed mercurial ointment.

ARABIANS—(*Continued.*)

978 to 1036	Ebnsina or Avicenna, "The Prince of Physicians." (*Canon medicinæ*). For five centuries his work was regarded as an infallible guide. Mentions croton tiglium, camphor, nux vomica, mace, nutmegs, &c.
980	Haly Abbas. (*Almalek or the Royal book*).
1179?	Avenzoar at Seville in Andalusia.
Died 1198 or 1199 1206	Averrhoes, a native of Cordova.
12th or 13th Century 1085	Albucasis or Alsaharavius. Mentions the preparation of rose water.
Died 1248	Abn Bitar or Ibn-Beitar. His works have not been printed, but they are constantly quoted by Persian authors on Materia Medica. (Royle, *Essay*, p. 28). He has a most extensive influence in the East.
	☞ Consult,—Amoreux (P. J.), "Essai Historique et Litter. sur la Médec des Arabes." Montp. 1805. 8vo. Reiske (J. J.), "Opusc. Med. ex Monum. Arabum et Ebræorum." Halæ 1776. 8vo.
	Oriental (Arabian, Persian, and Hindoo) Works on Pharmacology, which have been translated.
1055	Abu Mansur Movafik. *Liber fundam. Pharmacol.* Lat. Trans. by R. Seligmann. Vindob. 130—33.
	Pharmacopœa Persica, ex idiomate Persico in Latinum conversa. Paris, 1681.
1628	Shirazy (Nouraddeen Mohammed Abdullah). *Ulfâz Udwiyeh or the Mat. Med. in the Arab. Pers. and Hindevy lang.* Eng. transl. by F. Gladwin. Calc. 1793.
1669	Meer Mohummud Moomin. *Toohft al Moomineen.*
1769	*Mukhzun al Udwick* or *Storehouse of Medicines.* Hoogly. 1824. 2 vol. small fol.
	Taleef Shereef or *Indian Materia Medica.* 8vo. Calc. Eng. Trans. by G. Playfair, 1833.
	☞ Consult,—Ainslie (W.) "Mat. Ind." 1826. A copious list of Oriental works in vol. 2. p. 491. et seq.

EARLY CHRISTIAN WRITERS ON MEDICINE.

(Dark Ages).

	Medicine practised by Monks. Magic and astrology employed in medicine. The period of superstition and alchemy. The grossest impositions practised.
	The Neapolitan *schools of Monte-Cassino* and *Salerno* founded by Benedictine Monks.
Died 1807	Constantine *the African.* Wrote on diet, and simple and eye medicines.
1100	John of Milan, Author of *Medicina Salernitana.*
1110	Nicholas, surnamed Præpositus. *Dispensatorium ad aromatarios;* the first European pharmacopœia.
1150	Matthew Platerius. 1169 Ægidius of Corbeil.
1180	Hildegard, Abbess of Bingen. Born 1098. Wrote on medicines. Mentions *Christiana* (supposed to be *Helleborus niger*).
1259	Gilbert, an Englishman. Prepared acetate of ammonia and oil of tartar per deliquium. Extinguished mercury by saliva.
1193—1282	Albertus magnus An alchemist. Mentions zinc.
1260	John of St. Amand. Commented on the work of Nicholas.
1214—1284	Roger Bacon. The most philosophical of the alchemists.
1240—1313	Arnold of Villa Nova. Wrote a commentary on the Medicina Salernitana. Prepared the oils of turpentine and rosemary.
1235—1315	Raymond Lully. Prepared the oil of rosemary, acetate of lead, ammonio-chloride of mercury, nitric oxide of mercury, and spirit of wine.
1295	Simon de Cordo. 1317. Matthew Sylvaticus. 1320. (death) Peter de Apono. 1328
Died 1320	Francis of Piedmont. 1343. Dondis, father and son.
1343	Platerius (John). *Antidotarium Nicolai cum expositione.*
	St. Ardouin. Red oxide of mercury.
Born 1394	Basil Valentine. Prepared chemical medicines. Introduced antimonials (*currus triumphalis antimonii*). Was acquainted with the double chloride of iron and ammonia, and the acetates of lead.
1418	Valescus de Tarenta.
1491	*Ortus sanitatis* (first botanical figures).
1492	Columbus discovers America. Tobacco and its use for smoking first known.
1497	Mercury employed externally in syphilis.
1508	Guaiacum introduced into Europe by the Spaniards.
1493—1541	Paracelsus. A vain, ignorant, arrogant, drunken quack, fanatic, and impostor. He burnt publicly the works of Galen and Avicenna, declaring that his shoe-strings possessed more knowledge than those two celebrated physicians, and asserted that he possessed the elixir of life! He was a cabalist, astrologer, and believer in the doctrine of signatures. He conferred several important benefits on medicine: he overturned Galenism, introduced chemical medicines (employed mercury in syphilis), and substituted tinctures, essences, and extracts, for various disgusting preparations.
1530	Sarsaparilla first appeared in Europe.
	Early *botanists* in whose works several medicinal plants are distinctly referred to, in some cases for the first time. 1530. Brunfelsius; *Cardamine pratensis; Scrophularia nodosa.*
1532	1532. Tragus; Foxglove (*Campanula sylvestris*); Belladonna (*Solanum hortense nigrum*),
1542	Dulcamara. 1542. Fuchsius; Stramonium; Digitalis.

GREAT BRITAIN.

A. D.	
1579	Winter's Bark brought to Europe.
1633	Serpentary root noticed by THOMAS JOHNSON.
1674	WILLIS (Dr. Thos.). *Pharmaceutice Rationalis.* 8vo.
1675	Sulphate of Magnesia obtained from the Epsom Waters by Dr. GREW.
1687	FLOYER (Sir J. M. D.). Φαρμακο-Βασανος: *or the Touchstone of Medicines.* 2 vols. 8vo.
1691	BATE (Dr. G.). *Pharmacopœia Bateana*, by Fuller. 12mo.
1693	DALE, (Dr. S.). *Pharmacologia*, seu *Manud. ad Mat. Med.* 8vo. 1693.—3tia ed. 4to. 1737.
1697	Sulphuric acid made from sulphur.
1702	MEAD (Dr. Richd.). *A Mechanical Account of Poisons.* 5th ed. 1756. 8vo.
1718	QUINCY (Dr. J.). *Pharm. officinalis.* 8vo. 10th ed. 1736.
1740	Spigelia as an anthelmintic made known.
1742	Senega introduced by Dr. TENNANT.
1747	JAMES (Dr. R.). *Pharm. Univ. or a New Engl. Dispens.* 8vo.
1751	HILL (Dr. J.). *A Hist. of the Mat. Med.* 4to.
1754	LEWIS (Wm.). *The New Dispensatory.* 8vo.
1758	Kino described by Dr. FOTHERGILL.
1761	LEWIS (Wm.). *An Experim. Hist. of the Mat. Med.* 4to.
1763	Bark of Salix alba used by Rev. Mr. STONE.
1763	Receipts for preparing Ward's Medicines.
1768	ALEXANDER (Wm.). *Experim. Essays.* 8vo.
1770	ALSTON (Dr. Ch.). *Lectures on the Mat. Med.* 2 vols. 4to.
1770	MONRO (Dr. D.). *Treat. on Mineral Waters.* 8vo. 2 vols.
1733—1804	PRIESTLEY (Dr. J.) discovered oxygen, protoxide of nitrogen, and hydrochoric acid, ammoniacal, and sulphurous acid gases.
1775	RUTTY (Dr. J.). *Mat. Med. Antiq. et Nova.* Rotterod. 1775.
1775	WITHERING (Dr. Wm.). *Account of the Foxglove.* 8vo. Birm.
1780	BROWN (Dr. John). *Elementa Medicinæ.* Regarded all medicines as stimulants, and as differing from each other in little more than the degree in which they exert their stimulant power. (*Brunonian theory*).
1781	HOME (Dr. F.). *Methodus Mat. Med.* 12mo.
1782	SAUNDERS (Dr. W.). *Observ. on Red Peruv. Bark.*
1783	HOME (Dr. Fr.). *Clin. Experim. Hist. and Dissect.* 8vo.
1788	MONRO (Dr. Donald). *A Treat. on Med. and Pharm. Chym. and the Mat. Med.* 3 vols. 8vo.
1788	Angostura bark imported into England.
1789	CULLEN (Dr. Wm.). *A Treat. of the Mat. Med.* Regarded all medicines as acting by motions excited and propagated in the nervous system.
1790—94	WOODVILLE (Dr. W.). *Medical Botany.* 4 vols. 4to.
1792	MOORE (J.) *Essay on the Mat. Med.* 8vo.
1793	ALDERSON (Dr. J.). *Essay on Rhus Toxicodend.* 8vo.
1794-5	BEDDOES (Dr. Thos.) and WATT (Jas.). *Consid. on the Use of Factitious Airs.* 3 pts.
1794	RELPH (Dr. J.). *Inq. into the Med. Effic. of Yellow Bark.*
1794	PEARSON (Dr. R.). *Thesaurus Medicam.*
1797	PEARSON (Dr. R.). *Pract. Synops. of the Mat. Alim. and Mat. Med.* 8vo. 2nd ed. 1808.
1800	DUNCAN (Dr. A. Jun.). *Edinburgh New Dispensatory.* 11th ed. 1826. *Supplement*, 1829.
1800	SAUNDERS (Dr. Wm.). *Treat. on Mineral Waters.* 8vo.
1800	PEARSON (John). *Observ. on the Effects of var. articles of the Mat. Med. in the cure of Lues Venerea.* 8vo.
1801	PEARSON (Dr. G.). *Arrang. Catal. of the Art. of Food, Drink, Seasoning, and Medicine.* 8vo.
1804	MURRAY (Dr. J.). *System of Mat. Med. and Pharm.* 5th ed. 1828. 2 vols. 8vo.
1805	HAMILTON (Dr. J.). *Observ. on Purgative Med.* 8vo.
1805	The existence of Cinchonia inferred by Dr. Duncan, jun.
1809	*A Pract. Mat. Medica.* Lond. small 8vo.
1811	THOMSON (Dr. A. T.). *The Lond. Dispensatory.* 8vo. 9th ed. 1837.
1812	STOKES (Dr. Jonathan.). *A Botan. Mat. Med.* 4 vols. 8vo.
1812	PARIS (Dr. J. A.). *Pharmacologia.* 8vo. 6th ed. 1825.
1813	AINSLIE (Dr. W.) *Mat. Med. of Hindostan.* 4to.—*Mat. Indica.* 2 vols. 8vo. 1826.
1813	YOUNG (Dr. Thos.). *Classif. and Lit. of Mat Med.* in the *Introd. to Med. Lit.* 8vo.
1815	ROOTSEY (S.). *General Dispensatory.* 12mo. Brist.
1818	GRAY (S. F.). *Supplem. to the Pharmacopœias.* 8vo. 3rd. ed. 1824.
1824	PHILLIPS (R.). *Trans. of the Pharm. of the Roy. Coll. of Phys. Lond. with Notes and Illus.* Ditto, 1837. 3rd ed. 1838.
1825	BRANDE (W. T.). *Manual of Pharmacy.* 8vo.
1826	RENNIE (J.). *New Supplem. to the Pharmacopœias.* 8vo. 4th ed. 1837.
1827—30	*Flora Medica.* 2 vols. 8vo.
1829	CHRISTISON (Dr. Robt.). *Treat on Poisons.* 8vo. 3rd ed. 1835.
1830	BARKER (Dr. F.) and MONTGOMERY (Dr. W. F.). *Observ. Chem. and Pract. on the Dubl. Pharm.* 8vo.
1830	BARDSLEY (Dr. J. L.). *Hospital Facts and Observations.*
1831	STEPHENSON (Dr. J.) and CHURCHILL (J. M.). *Med. Botany.* 4 vols. 8vo. Fig. 2nd. ed. by G. Burnett.
1831	KANE (R. J.). *Elements of Pract. Pharm.*
1832	STEPHENSON (Dr. J.). *Med. Zoology and Mineralogy.* 8vo. 1832.
1832—3	THOMSON (Dr. A. T.). *Elem. of Mat. Med. and Therap.* 2 vols. 8vo.—2nd ed. in 1 vol.
1835	JOHNSTONE (Dr. J.). *A Therap. Arrangem. and Syllab. of Mat. Med.*
1835—7	PEREIRA (J.). *Lect. on Mat. Med. and Therap.* in *Lond. Med. Gaz.*
1836—8	SIGMOND (Dr. G. G.) *Lect. on Mat. Med. and Therap.* in the *Lancet.*
1837	STEGGALL (Dr. J.) *A Text Book of Mat. Med. and Therap.* small 8vo.
1838	LINDLEY (Dr. John). *Flora Medica.* 8vo.

GREAT BRITAIN—(*Continued*).

1838	Ure (Dr. Alex.). *Pract. Comp. of Mat. Med. adapt. for Infancy and Childhood.*
1839	Brande (W. T.). *Dict. of Mat. Med. and Pract. Pharm.*
1840	Lane (Dr. J. H.). *Compendium of Mat. Med. and Pharmacy.*

FRANCE.

1542—4	Sylvius (James).
1566	Antimony proscribed.
1666	Antimony permitted.
1672	Tartarized soda discovered by Seignette.
1686	Ipecacuanha celebrated in Paris.
1694	Pomet (P.). *Hist. Gén. des Drog. des Plantes, &c.* Eng. transl. 1712.
1697	Lemery (N.). *Pharmacopée Universelle.*
1697	Lemery (N.). *Traité Universel des Drog. simples.*
1713	Simaruba bark sent to Paris.
1708	Tournefort (J. P.). *Materia Medica.*
1709	Chomel (J. B.). *Abrégé de l'Hist. des Plant. usuelles.* 8vo.
1741	Geoffroy (S. F.). *Tract. de Mat. Méd.* 3 vols. 8vo.
1756	Helminthocorton sent to Paris.
1760	Goulard (Thos.). *Traité sur les Effets des Prep. de Plomb.* 8vo. 2 vols.
1762	Baumé (A.). *Elém. de Pharm. theor. et prat.* 2 vols. 8vo. 9me ed. 1818.
1770	Lieutaud (Jos.). *Précis de la Mat. Méd.* 2 vols. 8vo.
1773	De la Beyrie et Goulin. *Dict. raisonné-univ. de Mat. Méd.* 8 vols. 8vo.
1787	Venel. *Précis de Mat. Méd.* 8vo. 2 vols.
1789	Desbois de Rochefort. *Cours Elém. de Mat. Méd.* 8vo. 2 vols.
1803	Narcotine discovered by Derosne.
1804	Decandolle (A. P.). *Essai sur les Propr. Méd. des Plantes.* 8vo. —. 2nde ed. 1816.
	Alibert (J. L.). *Nouv. Elém. de Thérapeut.* 3 vols. 8vo. 5me ed. 1826.
1805	Schwilgue (C. J. A.). *Traité de Mat. Méd.* 3me ed. 1818. 2 vols. 8vo.
1805	Barbier (J. B. G.). *Princip. Gen. de Pharmacol. — Traité Elém. de Mat. Méd.* 2nde ed. 1824. 3 vols. 8vo.
1806	Chortet (J. J.). *Traité de Pharmacologie.*
1811	Picrotoxin discovered by Boullay.
1811	Virey (J. J.). *Traité de Pharm. théor. et prat.* 2 vols. 8vo. Nouv. ed. 1819.
1811	Iodine discovered by Courtois.
1814	The existence of morphia confirmed by Robiquet.
1814	Orfila (P.). *Traité des Poisons; ou Toxicol. Gén.* 3me ed. 1827.
1817—20	Pelletier and Caventou discover emetine, strychnia, brucia, veratria, and quina.
1818	Menard (J. L. M.). *Essai de Mat. Méd. et de Therap.* 8vo.
1819	Martin (C. P.). *Essai de Pharm. gén.* 8vo.
1819	Caventou. *Traité Elém. de Pharm. theoriq.* 8vo.
1819—20	Hanin. *Cours de Mat. Méd.* 8vo. 2 vols.
1820	Virey (J. J.). *Hist. Nat. des Médicam. des Alim. et des Poisons.* 8vo.
1820	Guibourt (N. J. B. G.). *Hist. Abreg. des Drog. simpl.* 8vo. 2 vols. 3me ed. 1836.
1821	Labarraque recommends the chlorides of lime and soda.
1821	Roques (Jos.). *Phytographie Médicale.* 2 vols. 4to.
1821	Magendie (F.). *Formulaire pour la préparation et l'emploi de plusieurs Nouv. Médicam.* 8me ed. 1835.
1823	Richard (A.). *Botanique Médicale.*
1825	Begin (L. J.). *Traité de Therap.* 8vo. 2 vols.
1826	Meconine discovered by Dublanc jeune.
1826	Edwards (H. M.) and Vavasseur (P.) *Manuel de Mat. Méd.* 1826.
1826	Bromine discovered by Balard.
1827—29	Chevallier (A.), Richard (A.), et Guillemin (J. A.). *Dict. des Drog.* 8vo. 5 vols.
1828	Jourdan (A. J. L.) *Pharmacopée Universelle,* 2 vols. 8vo. 2nde ed. 1840.
1828	Fée (A. L. A.). *Cours d'Hist. Nat. Pharm.* 2 vols. 8vo.
1828	Henry (N. E.) et Guibourt (N. B. G.). *Traité de Pharm. théoriq. et prat.* 8vo. 2 vols. 2me ed. 1834.
1828	Martinet (L.). *Manuel de Therap. et de Mat. Méd.* 1828.
1828—37	Bayle (A. L. J.). *Bibliothèq. de Therapeut.* 4 vols. 8vo.
1829	De Smyttère (P. J. E.). *Phytologie pharm. et Med.*
1829	Ratier (F. S.). *Traité de Mat. Méd.* 8vo. 2 vols.
1829—34	Merat (F. V.) et De Lens (A. J.). *Dict. Univ. de Mat. Méd.* 6 vols. 8vo.
1831	Chevallier et Idt. *Manuel du Pharmacien.* 2 vols. 8vo.
1831	Foy (F.). *Cours de Pharmacol.* 8vo. 2 vols.
1831—5	Richard (A.). *Elém. d'Hist. Nat. Méd.* 3 vols. 8vo.
1832	Codeia discovered by Robiquet.
1832	Narceina discovered by Pelletier.
1835	Cottereau (P. L.). *Traité Elém. de Pharm.* 8vo.
1836	Soubeiran (E.). *Nouv. Traité de Pharm.* 2 vols. 8vo.—2nde ed. 1840.
1836—39	Trousseau (A.) et Pidoux (H.). *Traité de Therap. et de Mat. Méd.* t. i. 1836. t. ii. part 1re. 1837. t. ii. part 2e. 1839.
1839	Bouchardat (A.). *Elém. de Mat. Méd.* 8vo.
1839	Galtier. *Traité de Mat. Méd.* 8vo. 2 vols.

*** Also *Bulletin de Pharmacie,* from 1809 to 1815. *Journal de Pharmacie,* from 1815 to the present time; and *Journal de Chimie Méd.,* from 1825 to the present time.

GERMANY.

1588	CAMERARIUS (J.). *Hort. Med. et Philosoph.*
1631	Emetic tartar mentioned by MYNSICHT.
1658	Sulphate of soda discovered by GLAUBER.
1669	Phosphorus discovered by BRANDT.
1641	SCHROEDER (J.). *Pharmacopœia Medico Chymica.* 4to.
1679	WEPFER (J. J.). *Cicutæ aquat. Hist.* 4to.
1684	WEDELIUS (G. W.). *Amœn. Mat. Med.* 4to. 1704.
1681	Nitric ether noticed by KUNKEL.
1686	Cascarilla mentioned by STISSER.
1701	RIVINUS (A. Q.). *Censura Medicam.* Officin. 4to.
1712	KÆMPFER (E.). *Amœntitates exoticæ.* 4to.
1714	ZORN (B.). *Botanologia Medica.* 4to.
1728	STAHL (G. E.). *Materia Medica.* 8vo.
1740	NEUMANN (Dr. C.). *The Chemical Works of;* by Dr. Lewis. 4to. 1759.
1740	HOFFMANN (F.). *Opera omnia physico-medica.* 6 vols. fol.
1741	CARTHEUSER (I. F.). *Rudiment. Mat. Med.* 8vo.
1755	LÖSECKE (I. L. L.). *Mat. Med.* 8vo.
1758	VOGEL (Dr. R. A.). *Hist. Mat. Med.* 8vo.
1760	STÖRCK (Ant.), on hemlock, stramonium, aconite, hyoscyamus, and colchicum.
1762	CRANTZ (H. I. P.). *Mat. Med. Syst.* 8vo. 3 vols. ed. 2nda. 1779.
1774	SPIELMANN (I. R.). *Institutiones Mat. Med.* 8vo. ed. nov. 1784.
1774	MURRAY (Dr. J. A.). *Apparatus Medicam.* 8vo. ed. alt. cur. Althof. 1793.
1791	ARNEMANN (Dr. J.). *Prakt. Arzneimittell.* 8vo. 6te Aufl. by Kraus 1819.
	ARNEMANN (Dr. J.). *Chirurg. Arzneimittell.* 8vo. 6te Aufl. by Kraus. 1818.
1790	GREN (F. A. C.). *Handb. d. Pharmakol.* 3te Aufl. 1813.
1793	BALDINGER (E. G.). *Litterat Universa Mat. Med.*, &c. 8vo.
1793—7	SCHLEGEL (J. C. T.). *Thesaurus Mat. Med.* 3 vols. 8vo.
1795—6	GMELIN (J. F.). *Appar. Medicam. regnum minerale complectens.* (See J. A. Murray). 8vo.
1797	SEGNITZ (F. L.) *Handb. d. prakt. Arzneimittell.* 8vo.
1797	JAHN (F.). *Auswahl d. wirksamst. Arzmeim.* 8vo.
1800	SWEDIAUR (D. F.). *Materia Medica.* 12mo.
1802	FRANK (I. S.). *Vers. einer theoret. prakt. Arzneimittell. nach den Princip. d. Erregungstheorie.*
1803	OBERREICH (C. F.). *Umriss einer Arzneimittell. nach den Grundsätzen der Erregungstheorie.*
1804	Morphia and Meconic acid discovered by Sertürner.
1805	BERTELÈ (G. A.). *Handb. einer dynam. Arzneimittell.* 8vo.
1807—9	BURDACH (Dr. K. F.) *Syst. d. Arzneym.* 3 vols. 8vo. 2nd ed. 1817—19.
1808	WURZER (F.). *Grundr. d. Arzneimittel.* 8vo.
1808 -24	PFAFF (C. H.), *System d. Mat. Med. nach chem. Princip.* Leipz. Bd. vij. 8vo.
1809	EBERMAIER (Dr. J. C.). *Taschenb. d. Pharm.* 8vo.
1809	MULLER (J. H.) *Handb. d. Lebens—u. Arzneimittell.*
1810	HAHNEMANN. *Organon d. rationellen Heilkunde.*
1815	SCHÖNE (K.). *Prakt. Arzneimittell. nach d. Grundsätz. d. Erregungsth.*
1816	SPRENGEL (Dr. K.). *Institutiones Pharmacologiæ.* 8vo.
1816—17	VOIGTEL (Dr. F. G.). *Vollst. Syst. d. Arzneimittell.* 2 vols. 8vo. Herausg. von. Kuhn.
1819—22	SCHWARTZE (Dr. G. W.). *Pharmacolog. Tabellen.* fol. 2te Aufl. 1833.
1820	TIEDEMANN (F.) and GMELIN (L.). On the absorption of Medicines.
1821—3	VOGT (Dr. P. F. W.). *Lehrb. d. Pharmakodyn.* 2 vols. 8vo. 2 Aufl. 1828.
1824—30	GEIGER (P. L.). *Handb. de Pharm.* 3 vols. 8vo. 5 Aufl. 1837.
1824	MARTIUS (Dr. C. F. P.). *Specimen Mat. Med. Brasil.* 4to.
1825	JÖRG (Dr. J. C. G.). *Material. zu einer künft. Arzneimittell.*
1825	SUNDELIN (Dr. C.). *Handb. d. spec. Heilmittell.* 3te Aufl. 1833.
1825—31	BISCHOFF (C. H. E.). *Handb. d. Arzneimittell.* 3 vols. 8vo.
1826	BERGEN (H. von). *Vers. einer Monograph. d. China.* 4to plates.
1826—32	RICHTER (G. A.). *Ausfuhr. Arzneimittell.* 6 vols. 8vo.
1827	DULK (Dr. F. P.). *Die preuss. Pharm. übers. u. erlaut.* 2 pts. 2nd ed. 8vo. 1829.
1827—28	HERGENRÖTHER (Dr. J.). *Syst. d. allgem. Heilungsl.* 2 vols. 8vo.
1827—34	GOEBEL (Dr. F.) and KUNZE (Dr. G.). *Pharmaceut. Waarenk.* 2 vols. 4to.
1828	DIERBACH (Dr. J. H.). *Die neuest. Entd. in d. Mat. Med.* 2te Aufl.
1829—34	HAYNE. *Darstellung und Beschreib. d. Arzneigewächse welche in d. neue preussische Pharmakopöe aufgenommen sind.* Von Brandt & Ratzeburg.
1829	HARTMANN (P. C.). *Pharmacologia dynamica.* 2 vols. 8vo.
1829	NEES VON ESENBECK (Dr. Th. F. L.), WEYHE (M. F.), WOLTER (Dr. J. W.), and FUNKE (P. W.) *Beschreib. officin. Pflanzen.* fol.
7829—33	BRANDT (J. F.) and RATZEBURG (J. F. C.). *Medizin. Zoologie.* 2 vols. 4to.
1829	MICHAELIS Dr.). Art. *Arzneimittel* in the *Encycl. Wört. d. med. Wissensch.*
1830	WENDT (Dr. J.). *Prakt. Mat. Med.* 8vo.
1830—32	NEES v. ESENBECK (Dr. T. F. L.) and EBERMAIER (Dr. C. H.). *Handb. d. Med. Pharm. Botanik.* 2 vols. 8vo.
1830—37	SACHS (L. W.) and DULK (F. P.). *Handwörterb. d. prakt. Arzneimittell.* 19 Lief. A— St.
1830	Creasote discovered by REICHENBACH.
1831—39	WIBMER (Dr. K.). *Die Wirk. d. Arzneim. u. Gifte.* 3 vols. and 1st part of the 4th vol.
1831	PFAFF (C. H.), *Pharmacop. Slesvico-Holsatica.* Kiliæ. 4to.
1831	DIERBACH (I. H.). *Abhandl. u. d. Arzneikrafte d. Pflanzen.* 8vo.
1831	PHOEBUS (Dr. P.). *Handbuch der Arzneiverordnungslehre.* 2nd ed. 2 parts. 1835-6. 3rd ed. 1839. 1840. The first edition was entitled "*Specielle Recepterkunst.*"
1832	ZENKER (Dr. J. C.) and SCHENK (Dr. E.). *Naturgesch. d. vorzüglichst. Handelspfl.* 2 vols. 4to.

GERMANY—(*Continued*).

1833	SCHROFF (Drs. E. S. & K. D.). *Arzneimittell. u. Receptirk.* 12mo.
1832	MARTIUS (Dr. T. W. C.). *Grundriss d. Pharmakogn. d. Pflanzenr.* 8vo.
1834	BRANDT (I. F.) and RATZEBURG (J. F. C.). *Deutschl. phanerog. Giftegewachse.* 4to.
1836	RADIUS (Dr. J.) *Auserles. Heilform.*
1837	DIERBACH (Dr. J. H.). *Die neuest. Entd. in d. Mat. Med.* first vol.
1837	BACHMANN (W. L.). *Handwörterb. d. prakt. Apotheker.* 2 vols.
1837	MITSCHERLICH (Dr. C. G.). *Lehrbuch der Arzneimittellehre.* 1st part of 1st vol. 1837.
1837—8	GRABAU (Dr. W.). *Chemisch-physiologisches System der Pharmakodynamik.* 2 pts. 8vo. Kiel.
1838	MARTIUS (Dr. T. W. C.). *Lehrb d. pharmaceut. Zoologie.* 8vo.
1838	PHOEBUS (Dr. P.). *Deutschl. kryptog. Giftgewachse.* 4to.
1839	SCHWARTZE (Dr. G. W.). *Allgem. u. spec. Heilquellenlehre.* 2 parts. Folio.

*** A considerable number of pharmaceutical journals are published in Germany. The following are perhaps the most important:—

1. *Almanach der Taschenbuch für Schiede-Küntsler und Apotheker.* 12mo. From 1780 to the present time.
2. *Berlinisches Jahrbuch für die Pharmacie und für die damit verbundenen Wissenschaften.* 12mo. (From 1795 to the present time). Now edited by Dr. Lindes.
3. TROMMSDORF (J. B.). *Journal der Pharmacie.* 8vo. 1794 to 1817. *Neues Journal der Pharmacie.* From 1817 to the present time.
4. BUCHNER (J. A.). *Repertorium für die Pharmacie.* 12mo. (From 1815 to the present time).
5. *Pharmaceutisches Central-Blatt.* 8vo. From 1830 to the present time. Edited by Drs. A. Weinlig and E. Winckler.
6. *Annalen der Pharmacie.* 8vo. From 1832 to the present time. A continuation of the *Magazin für Pharmacie.* From 1823—1831.
7. *Archiv der Pharmacie.* From 1822 to the present time. 8vo. Edited by R. Brandes and H. Wackenroder.
8. *Jahrbuch für praktische Pharmacie.* 8vo. 1838. By Drs. J. E. Herberger and F. L. Winckler.

HOLLAND.

1517—85	DODONÆUS (R.).
1577—1644	VAN HELMONT (John B.).
1605	CLUSIUS (C.). *Exoticorum.* libri x. Lugd. fol.
1648	PISO (G.). *De Medicina Brasiliensi.* Mentions ipecacuanha, copaiva, tapioca, &c.
1674	MARGGRAVIUS (C.). *Mat. Med. Contract.* Amst. 4to. ed. 2nda. 1682.
1719	BOERHAAVE (H.). *Mat. Med. et. Remed. Form.* Lugd. 8vo.
1740	DE GORTER (D.). *Mat. Med. exhibens virium medicamentorum catalogus.* Amst. 4to.
1793	BALTHASAAR (A.). *Verkorte, doch klaare en oefennende Materia Medica.* Amst. 8vo.
1797—1802	VOLTELEN (F. J.). *Pharmacolog. Univ.* 3 parts. Lugd. 8vo.
1799	YPEY (A.). *Introd. in Mat. Med.* Lugd. 8vo.
1811	YPEY (H.). *Handboek der Mat. Med.* Amst. 8vo.
1817	VAN HONTE (J. A.). *Handleiding tot de Materies Medica, of Leer der Geneesmiddeln.* Amst. 8vo.
1829	VAN WATER (J. A.). *Beknopt doch zoo veel mogelijk volledig Handboek voor de Leer der geneesmiddeln.* Amst. 8vo.

SCANDINAVIA.

(Denmark, Norway, Sweden, and Finland.)

1. DENMARK.

1640	PAULI (Simon), *Quadripartitum botan. de simpl. facult.* Rostochii 4to. Argent. 1667. 1668. 1674.
1658	BARTHOLINUS (C. Th.), *Dispensat. Hafn.* Hafn. 4to.
1772—1840	*Pharmacop. Dan.* Hafn. 1772. 1786. 1805. 1840.
1788	BANG (Fr. L.), *Pharmacop. in usum Nosocom. Frideric.* Havn. 12mo.
1799	MANGOR (C. E.), *Pharmacop. Paup.* Hafn. 4to.
1800	MANGOR (C. E.), *Armenapothek.* Hafn.
1804	TYCHSEN (Nicolai), *Theoretisk og praktisk Anviisning til Apothekerkunsten.* Udg. ved J. F. Bergsoe. Kbhn. 1 & 2 D. 8vo.
1809—10	MYNSTER (O. H.), *Pharmacologie.* Kbhn. 2 D. 8vo.
1810—12	WENDT (J. C. W.), *Anviisning til at samle, törre og conservere medicinske Planter og Plantedele.* Kbhn. 8vo.
1811	WENDT (J. C. W.), *Anviisning til Recepteerkunsten.* Kbhn. 8vo.
1813	*Pharmacop. milit.* Kbhn. 12mo.
1828	*Pharmacop. in praxi publ. a med. Dan. sequenda.* Hafn.
1834—5	DJÖRUP (M.), *Haandbog i Pharmacologien.* Kbhn. 8vo. 2 D. 2 Udg. 1837-8.
1838	OTTO (Carl), *Haandbog i Toxikologien.* Kbhn. 8vo.

*** Many articles on pharmacology will be found in the following Danish medical journals.

1. "Bibliothek for Læger." 1809—1839. Kbhn. 30 vol. 8vo.
2. "Hygæa." Udvigel ved Otto. 1826-7.
3. "Medicinsch-chirurgische Tidskrift."
4. "Ugeskrift for Lægar." 1839.

☞ For further information respecting Danish and Norwegian works on pharmacology consult:— WINTHER (M.) "Bibliotheca Danorum Medica Hafniæ." 1832.

SCANDINAVIA—(*Continued*).

2. Norway.

The Danish and Norwegian literature was common to both countries till their political separation in 1814, when Norway was united with Sweden. The language used in Norway in writing, and by all educated persons, in speaking, is identical with the Danish. Hence then every medical work published in Denmark till 1814 may be considered as also belonging to Norwegian literature. Since that year no work on pharmacology has been published in Norway. The King has, however, appointed a committee to prepare a new pharmacopœia for that country. The *Pharmacopœa Danica* has hitherto been used there. Several articles on pharmacology have appeared in the following Norwegian periodical:—*Eyr, et medicinsk Tidskrift.* 11 vols. Commenced in 1826, and continued by Dr. Holst till 1837.

3. Sweden.

1686 *Pharmacop. Holm.* Holm. 4to.
1705—1817 *Pharmacop. Suec.* Holm. 1705. 1775. Alt. 1776. Holm. 1779. 1817. 4to. & 8vo.
1749 Linne' (C. A.), *Mat. Med.* Stockh. 8vo. ed Schreb. 1772. 1782. 1787.
1735—1784 Bergmann (T.), A distinguished chemist.
1769 Retzius (A. J.), *Kort begrep af grunderne til Pharmacien.* Stockholm, 1769. 8vo.
1742—1786 Scheele (C. W.). Discovered Tartaric Acid in 1770, Chlorine in 1774, solid Citric Acid in 1781, and hydrous Prussic Acid.
1771 Retzius (A. J.), *Primæ lineæ Pharmaciæ, suecico idiomate editæ, jam Latine conversæ.* Göttingæ. 8vo.
1776 Bergius (P. J.), *Mat. Med. e Regno Vegetab.* Ed. 2nd. 2 T. 8vo. Stockh. 1782.
1789 *Pharmacop. milit., nav. et eorum usui accommod., qui impensis publ. curantur.* Holm 1789. 8vo.
1825—28 Ronander (C. W. H.), *System i Pharmakologien.* Stockholm. 1 Deel; 1, 2. Afdeling.
1834 *Pharmacopoea in usum Nosoc. milit. Holm.* Holm. 1834. 12mo.
Berzelius.

⁂ Besides several pharmacological papers in the following Swedish journals:—
"Svenska Läkare—Sällskapets Handlingar" Stockh. 1813—1833. 8vo. "Nija Handlingar" 1 Bd. 1837.
"Svenska Läkare—Sällskapets Arsberättesser." Stockh. 1813—1838. 8vo. 20 vol.
"Tidskrift för Läkare och Pharmaceuter." Stockh. 1832—1838. 8vo. 6 vol.
"Hygæa. Medicinisk og Pharmaceutisk Mönadskrift." Commenced April 1839.

4. Finland.

1797 Björnlund (B.), *Mat. Med. select.* Abo. 8vo.

RUSSIA.

1534 Herbal in the Russian language with figures.
1588 Treatise on Medicines in ditto.
1665 Apothecaries' garden at Moscow.
1778 *Pharm. Rossica.* Petropol. 4to.—1782. 8vo.
Pharm. castrens. Rossica. Petropol. 4to.
1784 Bacherach (A.), *Pharm. Rossica navalis.* Petrop. 8vo.
1801 Grindel (D. H.), *Grundriss d. Pharm.* Riga.
1803—8 ——————— *Russiches Jahrbuch d. Pharm.* Riga.
1806 Giese (F.), *Lehrb. d. Pharm.* Riga.
1807 *Pharmacopeia in usum Nosocomii Paup. Petropol.* 8vo.
1809—10 Giese (F.) & Grindel (D. H.), *Russ. Jahrb. d. Chem. und Pharm.* 2 Bde. Riga. 1809.—Dorpat. 1810. 7vo.
1819 Grindel (D. H.), *Med. pharm. Blatter.* 8 Hefte. Riga. 1819 & 1820. 8vo.
1829 Horaninow (P.). *Systema Pharmacodynamicum.* 8vo. Petrop.

☞ Further information on Russian medicine may be obtained in the following works:—
Grahl (J. F.), "Diss. Med. sistem quædam medicam. Rossor. domest." Jenæ. 1790.
Richter (W. M.), "Geschichte d. Med. in Russl." Bd. 3. 1813—1817. Moskwa.

ITALY.

1500—55 Brassavola (A. M.). *Examen omnium simplicium.*
1501—77 Matthiolus (P. A.). *Commentarii in libros sex Discoridis.*
1502—53 Serveto (M.)
1502 Valerian recommended in epilepsy by Columna.
1553—1616 Alpinus (Prosper). On the medicine and plants of the Egyptians.
1647 Sala (Ang.).
1707 Sugar of milk made known by Testi. (Beckmann, *Hist. and Invent.* iv. 602).
1734 Mazini (J. B.). *Mechanica Medicamentorum.*
1791—5 Carminati (B.). *Hygiene, Terapeutice, et Materia Medica.* 4 vols. 8vo. Papia.
1808 Doctrine of contra-stimulus by Rasori and Borda.
1824 Alberti (A.). *Flora Medica.* 6 vols. 8vo. Milan.
1824 Ambrosiani (F.). *Manuale por Droghiere.* Pavia. 2 vols. 8vo.
1825 *Trattato delle Droghe semplici.* 6 vols. Milan.

ITALY—(*Continued.*)

1825	STELLATI (V.). *Elementi di Mat. Med.* 2 vols. 8vo. Napoli.
1826—7	TADDEI. *Farmacopea generale,* 4 vols. 8vo. Firenze.
1827	*Dizionnario de Medicamenti.* Modena.
1827	*Dizionnario farmaceutico galeno-chemico.* Neapl.
1827	BARZELOTTI (I.). *Epitome delle istruzioni theoretico-pratiche.* 8vo. Pisa.
1828	BRUSCHI (D.). *Institutioni di Materia Medica.*
1830	ARGENZIANO (P.). *Elementi di Materia Medica.* Napoli.
1833	VIGNA (C.). *Manuale di Mat. Med.* Milano. 8vo.
1833	GIACOMINI (G.). *Trattato filosofico sperimentale dei Soccorsi Terapeutici.* 4 vols. 8vo. Padova.
1833	FOLCHI (I.). *Materiæ Medicæ compend.* 2 vols. 8vo. Ad Thermas Agrippæ.

SPAIN.

1569	MONARDEZ (Nic.), *Historia medicinal de las cosas que se traen de nuestras Indias Occidentales que sirven en medicina.* Sevil. 4to. Lat. transl. by Clusius 1574. Antw.——Monardes mentions Cebadilla, Sarsaparilla (çarçaparilla), Sassafras, Balsam of Peru, Balsam of Tolu, Logwood, &c.
1578	ACOSTA (Chr.), *Drogas de las Indias.* 4to. Burgos.
1615	HERNANDEZ (*Fr.*), *Nova plant. anim. min. Mexican. historia.* Rom. 1651. Fol. (A Spanish edit. by F. Ximenes in 1615).
1632	Cinchona imported into Spain.
1729	*Pharm. Madritensis,* 4to. 1794. 8vo. 1798. Lips. 1822.
	RUIZ (Don Hipp.) and PAVON (Don Jose), *Flora Peruviana.* Cinchona, Krameria.
1786	TAVARES (*Fr.*), *De pharmacologia libellus.* Coimbr. 8vo.
1787	RODERIGUEZ Y SALV. SOLIVA (J.), *Des efficaces virtudes nuevamente descubiertas o comprob. en varias plantas.* Madrid.
1789	RANCÉ (J.), *Tratado theor. prat. de Mat. Med.* Barcelona. 1789.
1798	HERNANDEZ DE GREGORIO (M.), *Diccionario dem. de Farmacia.* Madrid. 4to.
1800	CARBONEL (F.), *Pharmaciæ elementa, chem. recent. fundament. innixa.* Barcinon.——French transl. by J. H. Cloquet, from the 3rd ed. Paris, 1821.

PORTUGAL.

1563	GARCIAS AB ORTA, *Coloquios dos simples y droguas he cousas medicinais da India.* Goa. 4to. Lat. transl. by Clusius, 1567. Antw. 8vo.
1785	HENRIQUEZ DE PAIVA (J. J.), *Pharm. Lisbonn.* Lisb. 8vo.
1794	*Pharmacopeia Geral para o Reino e Dominios de Portugal.* 8vo. 2 vol. Lisbon.
1800	BROTERO described the Ipecacuanha plant.
1810	GOMES obtained crystallized Cinchonia.

AMERICA.

1801	BARTON (Dr. B. S.). *Collections for an Essay towards a Materia Medica of the United States.* 3rd ed. 1810.
1806	COXE (Dr. J. R.). *The American Dispensatory.* 8vo. 1806.
1810	THACKER (Dr. J.). *American New Dispensatory.* 8vo. 2nd ed. 1813.
1817	CHAPMAN (Dr. N.). *Elements of Therapeutics and Mat. Med.* 4th ed. 1825. 2 vols. 8vo.
1817—18	BARTON (Dr. W. P. C.). *Vegetable Materia Medica of the United States.* 2 vols. 4to. fig. 2nd ed. 1825.
1817—21	BIGELOW (Dr. J.). *American Medical Botany.* 2 vols. 8vo. Boston.
1822	EBERLE (Dr. J.). *Treatise on Mat. Med. and Therapeutics.* 2nd ed. 1824. 2 vols. 8vo.
1822	BIGELOW (Dr. J.). *A Treatise on the Materia Medica, intended as a sequel to the Pharmacopœia of the United States.* Boston.
1830—34	*Journal of the Philadelphia College of Pharmacy.* Ed. by B. ELLIS. 1830—1834. 6 vols. 8vo. Philad.
1831	*The Pharmacopœia of the United States of America.* By authority of the National Medical Convention, held at Washington, A.D. 1830.
1833	WOOD (Dr. G. B.) and BACHE (Dr. F.). *The Dispensatory of the United States.* 3rd ed. 1836.
	DUNGLISON (Dr. R.). *General Therapeutics, or principles of Medical Practice, with Tables of the chief remedial agents, and their preparations, and of their poisons and their antidotes.*
1835	*American Journal of Pharmacy.* Published under the auspices of the Philadelphia College of Pharmacy. (A continuation of the *Journal of the Philadelphia College of Pharmacy*) From 1835 to the present time. 8vo.

II. *REGNUM ORGANICUM.*—THE ORGANIC KINGDOM.

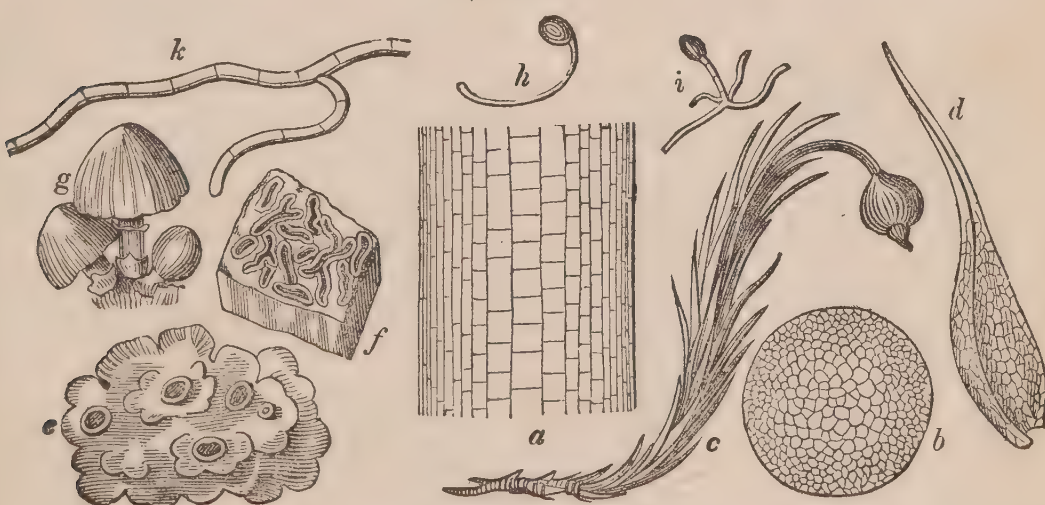
I. SUBREGNUM VEGETABILE.—THE VEGETABLE SUB-KINGDOM.

Division I. Cryptogamia.—Flowerless Plants.

Cryptogamia, *Linn.*—Acotyledones, *Juss.*—Cellulares, *Dec.*—Acrogenæ, *Lind.*

Essential Character.—*Substance of the plant* usually composed of cellular tissue chiefly, either in a spheroidal or elongated state; spiral vessels or ducts only present in the highest orders. *Stem* either increasing by an extension of its point, or by a regular or irregular development in all directions from one common point; not increasing perceptibly in thickness or density when once formed. *Cuticle* generally destitute of stomata. *Sexual organs*, and consequently *flowers*, absent. Reproduction taking place either by *spores* or *sporules* [*sporæ* seu *sporulæ*], which are inclosed in cases called *thecæ* [*sporangia*], or imbedded in the substance of the plants; or else by a mere dissolution of the utricles of cellular tissue; *germination* occurring at no fixed point, but upon any part of the surface of the spores (*Lindley*).

Fig. 68.



Structure of Cryptogamic Plants.

a. Longitudinal section of a stem.
b. Transverse section of a stem.
c. Stem of a moss with leaves and theca, or seed-case.
d. Leaf of a moss magnified.
e. Leafy thallus of a lichen with apothecia.
f. Crustaceous thallus of a lichen with apothecia.
g. Fungi of the highest tribe.
h. i. Fungi of the lowest rank.
k. Conferva magnified.

Order 1. Al'gæ, *Juss.*—The Sea-weed Tribe.

Algaceæ, *Lind.*

Essential Character.—Leafless, flowerless plants, with no distinct axis of vegetation, growing [with very few exceptions] in water, frequently having an animal motion, and consisting of simple vesicles lying in mucus, or of articulated filaments, or of lobed fronds, formed of uniform cellular tissue. *Reproductive matter* either altogether wanting, or contained in joints of the filaments, or deposited in *thecæ* of various forms, size, and position, caused by dilatations of the substance of the frond. *Sporules* with no proper integument, in germination elongating in two opposite directions (*Lindley*).

Properties.—None of the plants of this order are poisonous. A mucilaginous or gelatinous matter (*carrageenin, pectin*) and sugar (*mannite*) render several species highly nutritious, emollient, and demulcent. Some Algæ have been found beneficial in scrofulous affections and glandular enlargements. The good effects are referrible to *iodine*, and in part, perhaps, to *alkaline salts*. A vermifuge property has been ascribed to some species.

Laennec (*Treat. on Diseases of the Chest*, by Dr. Forbes, p. 369) tried the influence of an artificial "marine atmosphere" (air impregnated with the vapour of fresh sea-weed) on consumptive patients, and was impressed with an idea of its efficacy; but experience shows that the inhabitants of sea-coasts are as liable to phthisis as those of inland districts.

Fu'cus vesiculo'sus, Linn. D.—*Sea Wrack.*

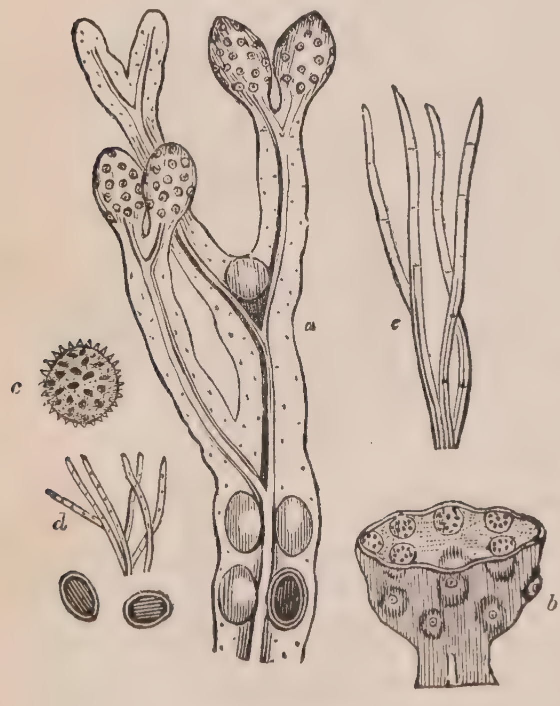
Sex. Syst. Cryptogamia, Algæ.

(Herba cum fructu. *Ph. Dub.*)

History.—Theophrastus (*Hist. Plant.* lib. iv. cap. vii.) mentions several species of Algæ (φῦκος), but he includes under this name Rocella tinctoria. Fucus vesiculosus is sometimes termed *Quercus marinus*, *bladder fucus*, and *common sea-ware.*

Botany. *Gen. Char.*—*Frond* plane, compressed or cylindrical, linear, dichotomous, coriaceous. *Air-vessels* [*vesiculæ*] when present innate in the frond, simple, large. *Receptacles* terminal (except in *F. nodosus*), turgid, containing tubercles, imbedded in mucus, and discharging their *seeds* [*sporangia*] by conspicuous pores (*Greville*).

Fig. 69.



Fucus vesiculosus.

a. Upper part of a frond.
b. Section of a receptacle.
c. Tubercle.
d. Filaments and sporangia, of which the tubercles are composed.
e. Filaments which issue from the pores on the surface of the frond.

Sp. Char.—*Frond* plane, linear, dichotomous, entire at the margin. *Air-vessels* roundish-oval in pairs. *Receptacles* mostly elliptical, terminating the branches (*Greville*).

Hab.—Sea-shores. Very common every where.

Physical Properties.—Its substance is thickish, flexible, but very tough. Its colour is dark, olivaceous, glossy green, paler at the extremities, becomes black by drying. Its odour is strong; its taste nauseous.

Composition and Characteristics. — It has been analyzed by Stackhouse (*Dict. Scien. Nat.* xvii. 500); by Gualtier de Claubry (*Ann. Chim.* xciii. 116); by John (*Schweigger's Journ.* xiii. 464); and by Fagerstrom (*Gmelin, Handb. d. Chem.* Bd. ii. S. 1354).

It is composed of *cellular tissue*, *mucilaginous matter* (pectin?), *odorous oil*, *colouring* and *bitter matters*, and *salts of calcium* and *sodium* (iodide, sulphates, and chloride).

By treating the distilled water of Fucus vesiculosus with ether, *a semi-solid white oil* is extracted, which is the odorous principle. The aqueous decoction of this plant is neutral, and contains chloride of sodium, sulphates of soda and lime, and a mucilaginous substance analogous to *pectin*. It yields, with chlorine and starch, faint traces only of iodine. But if alcohol be added, by which the pectin and a part of the sulphates are thrown down, the alcoholic liquor evaporated, and the residue mixed with potash, then calcined, and afterwards treated with hydrochloric acid to disengage hydrosulphuric acid, we may detect iodine in the filtered liquor by the deep blue colour formed on the addition of starch and chlorine (Guibourt, *Hist. des Drog*. 3d ed. ii. 395). By combustion in the open air, this plant yields an ash, called *kelp* (vide pp. 111 and 323); and by incineration in a covered crucible it gives a charcoal, termed *vegetable ethiops*.

Physiological Effects.—During the winter, in some of the Scottish islands, horses, cattle, and sheep, are fed on it (Greville, *Algæ Brit.* xx.) Its local action is detergent, and perhaps discutient. Its remote effects are probably analogous to those caused by small doses of iodine (*vide* p. 113), modified by the influence of salts of sodium and calcium.

Uses.—Frictions of the plant, with its contained mucus, were employed, with supposed advantage, by Dr. Russel (*Dissert. on the Use of Sea-Water*, 5th ed. 1769, pp. 41 and 44), in glandular enlargements and other scrofulous tumors: the parts were afterwards washed with sea-water. He also gave internally the expressed juice of the vesicles in glandular affections (*op. cit.* p. 99).

Æthiops vegetabilis. Vegetable ethiops.—This is prepared by incinerating Fucus vesiculosus in a covered crucible. It is composed of *charcoal, chloride of sodium, carbonate of soda, sulphurets of sodium and calcium*, and traces of an *alkaline iodide*. It has been exhibited in bronchocele and scrofulous maladies. Dr. Russel (*op. cit.* p. 98) says, it far exceeds burnt sponge in virtue. It has been employed also as a dentrifice. The dose of it is from ten grains to two drachms.

Chon'drus cris'pus, Grev.—*Carrageen or Irish Moss.*

Sex. Syst. Cryptogamia, Algæ.

(Planta, *Offic.*)

History.—It was introduced into medicine by Mr. Todhunter, of Dublin (Reece's *Monthly Gazette of Health*, Jan. 1831).

Botany. *Gen. Char.*—*Frond* cartilaginous, dilating upwards into a flat, nerveless, dichotomously divided frond, of a purplish or livid red colour. *Fructification:* subspherical *capsules* [*sporangia?*] in the substance of the frond (rarely supported on little stalks), and containing a mass of free *seeds* [*sporules?*] (*Greville*).

Sp. Char.—*Frond* plane, dichotomous, the segments linear, wedge-shaped. *Capsules* subhemispherical, imbedded in the disk of the frond (*Greville*).

Hab.—On rocks and stones on the sea-coast: very common. For dietetical and medicinal uses it is collected on the coasts of Ireland, is washed, bleached, and dried.

Physical Properties.—In the recent state it is purple-brown or purple-red, becoming greenish and ultimately whitish in decay. As met with in commerce, it is dry, crisp, mostly yellowish or dirty white, but intermixed with purplish red portions, inodorous or nearly so, with a mucilaginous taste. It swells up in water. A calcareous meshy crust (consisting of various species of *Flustra*) is frequently found on the frond.

Composition.—It has been analyzed by Herberger (Dierbach, *Die neuesten Entd. in d. Mat. Med.* 1837), and by Feuchtwanger (*American Journal of Science and Arts*, xxvi.)

Herberger.	
Vegetable jelly	79·1
Mucus	9·5
Two resins	0·7
Fatty matter and free acids	*traces*
Chlorides of sodium and calcium, potash, lime, &c.	*traces*
No traces of iodine or bromine could be recognized.	

Feuchtwanger.

Jelly { Pectin (a large portion). Starch.
Oxalate of lime.
Compounds of sulphur, chlorine, and bromine.
No fungic, boletic, or lichenic acids.

The mucilaginous matter (called by some writers *vegetable jelly*, by others *pectin*,) appears to me to be a peculiar substance, which I shall term *carrageenin*. It is soluble in boiling water, and its solution forms a precipitate with diacetate of lead and silicate of potash, and, if sufficiently concentrated, gelatinizes on cooling. Carrageenin is distinguished from ordinary gum by its aqueous solution not producing a precipitate on the addition of alcohol; from starch, by its not assuming a blue colour with tincture of iodine; from animal jelly, by tincture of nutgalls causing no precipitate; from pectin, by acetate of lead not throwing down any thing; as well as by no mucic acid being formed by the action of nitric acid. Dr. Lucae (*Berlin. Jahrb.* xxxiv. Abth. i.) regards carrageenin as more closely resembling animal jelly than any other substance.

Chemical Characteristics.—The presence of carrageenin in the decoction is demonstrated by the tests just enumerated. No iodine is recognizable by nitric acid and starch. Oxalate of ammonia detects lime (or calcium) in solution, while nitrate of silver points out the presence of chlorine. Guibourt (*Journ. de Chim. Méd.* viii. 663) could recognize neither sugar nor magnesia.

Physiological Effects.—Chondrus crispus is nutritive, very digestible, emollient, and demulcent.

Uses.—It is a popular remedy for pulmonary complaints (especially of a phthisical character), chronic diarrhœa and dysentery, scrofula, rickets, enlarged mesenteric glands, irritation of bladder and kidneys, &c. As a culinary article it is employed as a substitute for animal jelly, in the preparation of *blanc-mange*, jellies, white soup, &c.

Administration.—It is usually exhibited in the form of decoction or jelly.

1. *Decoctum Chondri.*—Macerate half an ounce of carrageen in cold water, during ten minutes; then boil in three pints of water, for a quarter of an hour. Strain through linen. Milk may be substituted for water when the decoction is required to be very nutritious. By doubling the quantity of carrageen a *mucilage* is procured. Sugar, lemon juice, tincture of orange-peel, or aromatics, as cinnamon or nutmeg, may be employed as flavouring ingredients.

2. *Gelatina Chondri.*—Prepared by concentrating the decoction, or by employing a larger quantity of carrageen.

Gigarti'na Helminthocor'ton, Grev.—*Cor'sican Moss.*

Sex. Syst. Cryptogamia, Algæ.

(Planta, *Offic.*)

History.—This plant has been in use for several centuries among the natives of Corsica, as a remedy for intestinal worms. In 1756, Vaucher sent it to Paris (P. J. Schwendimann, in Schlegel's *Thesaurus Mat. Med.* t. iii. p. 181).

BOTANY. *GEN. CHAR.—Frond* horny or cartilaginous, filiform, cylindrical, irregularly branched. *Fructification* uniform; spherical, sessile *capsules* containing a globose mass of *seeds* [*sporules?*] (*Greville*).

SP. CHAR.—Frond cartilaginous, terete, tufted, entangled. *Stem*, filiform, creeping: branches, setaceous, somewhat dichotomous, marked indistinctly with transverse streaks.

HAB.—The Mediterranean Sea, on the shores of Corsica.

PHYSICAL PROPERTIES.—Under the name of Corsican moss is sold in the shops a mixture of various marine vegetables and animals. The essential, though usually smaller, part of the mixture is the Gigartina Helminthocorton; the remainder consists of Corallines, Sertularias, and Ceramiums, to the number of twenty species (Decandolle, *Essai sur les Propriétés Méd.* p. 348, 2d éd.) Lamouroux states he found the remains of eighty species of marine plants (Fée, *Cours d'Hist. Nat.* i. 147). See also T. C. Martius, (*Grundriss d. Pharmakog.* 12).

The structure of the frond of Gigartina Helminthocorton is "very peculiar, being exceedingly lax and cellular, with a consistence similar to that of the stems and leaf-stalks of some aquatic herbaceous phænogamous plants, and having the appearance of articulations which do not actually exist" (Greville, *Algæ Brit.* p. 146). The fructification is scarcely ever seen. The plant has a reddish grey colour externally, but is whitish internally. Its odour is strong, marine, and disagreeable: its taste is saline.

COMPOSITION.—Bouvier (*Ann. de Chim.* ix. 83, 1791) obtained from 100 parts of Corsican moss, *vegetable jelly* (pectin?), 60·2; *vegetable fibre*, 11·0; *chloride of sodium*, 9·2; *sulphate of lime*, 11·2; *carbonate of lime*, 7·5; *iron, manganese, silica*, and *phosphate of lime*, 1·7. Straub (*Gilbert's Ann.* Bd. 66, S. 242), and Gualtier de Claubry (*Ann de Chim.* xciii. 134), have subsequently detected iodine, but the quantity is small.

CHEMICAL CHARACTERISTICS.—Corsican moss effervesces with acids, owing to the carbonate of lime which it contains. The brown watery infusion is deepened in colour by sesquichloride of iron, and lets fall some brown flocculi. Tincture of galls does not alter it. Nitric acid and starch give no indication of iodine.

PHYSIOLOGICAL EFFECTS.—Its effects are not very obvious. The vegetable jelly must render it nutritive; the iodine and saline matters alterative. Mr. Farr (*A Treat. explan. of a Method whereby occult Cancers may be cured*, 2d ed. 1825) says, that after using the decoction for six or seven days, it acts as a diuretic and diaphoretic, and occasionally produces nausea and giddiness: after some time the stools become darker, present greenish specks, and are sometimes slimy.

USES.—It has been principally celebrated as an anthelmintic against the large round worm (*Ascaris lumbricoides*). Bremser (*Sur les Vers Intestin.* 417) ascribes its efficacy to chloride of sodium.

In 1822, Mr. Farr brought it forward as a remedy for cancer. He was led to try it from the circumstance of Napoleon Bonaparte having stated to Barry O'Meara, that it was used in Corsica for dispersing tumors. Experience does not warrant us in ascribing any benefit to its employment in this disease.

ADMINISTRATION.—In powder it is given in doses of a scruple to two drachms, mixed with honey or sugar; but the more usual mode of exhibition is in the form of decoction, prepared by boiling from four to six drachms of Corsican moss in a pint of water; of this the dose is a wineglassful, three times daily.

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1. *Algæ Esculentæ.—Esculent Sea Weeds.*

FIG. 70.

Esculent Sea Weeds.

a, Rhodomenia palmata (or dulse).
b, Rhodomenia ciliata.
c, Laminaria saccharina.
d, Iridæa edulis.
e, Alaria esculenta.
f, Ulva latissima.

Several species of the inarticulated Algæ are occasionally employed, in some parts of the British islands, as articles of food, or as condimentary substances. Taken in this way, they might perhaps prove serviceable in scrofulous affections and glandular enlargements. Besides the species above depicted, the following have also been used: *Laminaria digitata* (or *Tangle*, p. 110, fig. 36, *d*), *Porphyra laciniata* and *vulgaris* (commonly called *Laver*), *Laurentia pinnatifida (Pepper-dulse)*, &c. (For further details, consult Dr. Greville's *Algæ Britannicæ*, xix.; Loudon's *Encyclopædia of Gardening*, 2d ed. p. 886; and Plenck's *Bromatologia*, pp. 171-3).

2. *Sea Weeds from which Kelp and Iodine are procured.*

These have been before referred to (*vide* pp. 110 and 323). To the information already given, I have only to add the following table drawn up by Mr. Whitelaw, a manufacturer in Glasgow, from his own experiments, showing the proportion of iodine contained in some of the most common Algæ on our sea coasts (Thomson's *Chemistry of Organic Bodies*, 946).

	Ratios of Iodine.
Laminaria digitata	100
Laminaria bulbosa	65
Laminaria saccharina	35
Fucus serratus	20
Fucus nodosus	15

The quantities of chloride of potassium were nearly in the same ratio.

ORDER 2. LICHE'NES, *Juss.*—THE LICHEN TRIBE.

LICHEN ACEÆ, *Lind.*

ESSENTIAL CHARACTER.—*Perennial* plants, often spreading over the surface of the earth, or rocks, or trees, in dry places, in the form of a lobed and foliaceous, or hard and crustaceous or leprous substance, called a *thallus*, *crust*, or *frond (receptaculum commune).* This *thallus* is formed of a cortical and medullary layer, of which the former is simply cellular, the latter both cellular and filamentous. In the crustaceous species the cortical and medullary layers differ chiefly in texture, and in the former being coloured, in the latter colourless; but in the fruticulose or foliaceous species, the medulla is distinctly floccose, in the latter occupying the lower half of the thallus, in the former enclosed all round by the cortical layer. *Reproductive* matter of two kinds: 1, *sporules (sporulæ)*, lying in membranous tubes *(thecæ)* immersed in *nuclei* of the medullary substance, which burst through the cortical layer, and colour and harden by exposure to the air in the form of little disks *(apothecia)*, which have received different names according to their forms; 2, the separated cellules of the medullary layer of the tissue *(Lindley*, with some additions).

PROPERTIES.—The lichens, at least the foliaceous ones, contain a starchy substance (called *feculoid* or *lichenin*), which renders them nutritive, emollient, and demulcent. They also possess a bitter principle *(cetrarin)*, from which they derive tonic properties. Several lichens, by maceration in ammoniacal solutions, develope brilliant colours, which render them valuable as dyes. The colorific principle of Rocella tinctoria is termed *erythrin*, while that of Variolaria dealbata is called *orcin*.

Cetra'ria islan'dica, Ach. L. D. (Lichen islandicus, E.)—*Iceland Moss.*

Sex. Syst. Cryptogamia, Algæ.

(Cetraria, *Ph. Lond.;* Planta, *Ph. Dub.;* Lichen Islandicus, *Ph. Ed.)*

HISTORY.—The medicinal properties of this plant (usually termed *Lichen islandicus*) were probably first known to the natives of Iceland. According to Borrichius, the Danish apothecaries were acquainted with them in 1673. In 1683, Hiärne spoke favourably of its effects in hæmoptysis and phthisis (Murray, *App. Medicam.* v. 508).

BOTANY. *GEN. CHAR.*—*Thallus* foliaceous, cartilagineo-membranaceous, ascending and spreading, lobed and laciniated, on each side smooth and naked. *Apothecia* orbicular, obliquely adnate with the margin of the thallus, the lower portion being free (not united with the thallus); the disk coloured, plano-concave, with a border formed of the thallus and inflexed (*Hooker*).

FIG. 71.

Cetraria islandica.

a, The *apothecia* on the larger lobes of the thallus.

SP. CHAR. — *Thallus* erect, tufted, olive brown, paler on one side, laciniated, channelled, and dentato-ciliate, the fertile lacinia very broad. *Apothecia* brown, appressed, flat, with an elevated border *(Hooker)*.

The apothecia are generally wanting on the plant of the shops.

HAB.—Dry mountainous districts of the new and old continents. Although met with in considerable abundance in Scotland, it is never gathered there as an article of commerce.

PHYSICAL CHARACTERS.—As met with in commerce, Iceland moss is brownish or greyish white, with white farinaceous spots on it, but rarely having apothecia. It has little or no odour, and a slightly bitter taste. Its powder (or *farina*) is whitish grey.

COMMERCE.—It is imported in barrels and bags from Hamburgh and Gothenburgh, and is said to be the produce of Norway and Iceland. In 1836, 20,599 lbs. paid duty; in 1837, 12,845 lbs.; and in 1838, only 5179 lbs.

COMPOSITION.—It has been analyzed by Berzelius (*Ann. de Chim.* xc. 277), who obtained the following products from 100 parts:—*starchy matter* (lichenin), 44·6; *bitter principle* (cetrarin), 3·0; *uncrystallizable sugar*, 3·6; *chlorophylle*, 1·6; *extractive matter*, 7·0; *gum*, 3·7; *bi* *lichenates of potash and lime* mixed with *phosphate of lime*, 1·9; *amylaceous fibrin*, 36·2.

The *starchy matter (lichenin, feculoid substance of lichens)* is somewhat different from ordinary starch. No particles analogous in their physical properties to other feculas can be observed. Water extracts a substance like *amidin* (the soluble matter of fecula). But as no boiling, however long continued, deprives the insoluble texture of Iceland moss of the property of being tinged blue by iodine, Raspail (*Chim. Organ.* i. 540) infers that the *amylin* (the insoluble or membranous portion of fecula) remains enveloped in the texture in which it was formed; thus constituting, I presume, the *amylaceous fibrin* of Berzelius. Lichenin is composed of $C^{10}\ H^{11}\ O^{10}$.

The *bitter principle (cetrarin)* is white, intensely bitter, soluble in alcohol (especially at a boiling temperature), ether, less so in water, volatile oil, and creosote. It is coloured blue by hydrochloric acid when aided by heat, combines with alkalies, and forms a red precipitate with the salts of iron, and a greenish one with those of copper (Herberger, *Journ. de Pharm.* xxiii. 505).

Lichenic acid is composed of $C^4\ H^2\ O^4$. It forms a reddish precipitate with the per-salts of iron.

Chemical Characteristics.—Iceland moss swells up in cold water, to which it communicates a brownish tint. Boiled in water it yields a liquid which, when sufficiently concentrated, gelatinizes on cooling. The decoction, when cold, forms with iodine a blue compound (*iodide of amidin*); with the sesquichloride of iron, a dingy purplish red (*cetrarate* and *lichenate of iron*); with diacetate of lead, a copious whitish precipitate (*amidate of lead*); with sulphate of copper and caustic potash, a green precipitate (*cetrarate of copper*).

Physiological Effects. (*a.*) *On animals.*—In Carniola, pigs, horses, and oxen, are fattened by it (Murray, *App. Med.* v. 506).

(*b.*) *On man.*—It is a mucilaginous or demulcent tonic, without any trace of astringency. If the bitter matter (*cetrarin*) and extractive be removed, it is nutritive, emollient, and demulcent, like ordinary starch, over which it has no advantage. Captain Sir John Franklin and his companions tried it as an article of food, when suffering great privations in America, but its bitterness rendered it hardly eatable (*Narrative of a Journey to the Shores of the Polar Sea*, p. 414. 1823).

Uses.—Iceland moss is well adapted to those cases requiring a nutritious and easily-digested aliment and a mild tonic, not liable to disorder the stomach. It has been principally recommended in chronic affections of the pulmonary and digestive organs, particularly phthisis, chronic catarrh, dyspepsia, chronic diarrhœa, and dysentery; but its efficacy has been much exaggerated.

Administration.—It is best exhibited in the form of decoction. When employed as an alimentary substance merely, the bitter matter should be extracted before ebullition. This is effected by digesting the lichen in a cold weak alkaline solution (composed of water 300 parts, and carbonate of potash 1 part), and afterwards washing it with cold water. It is then to be boiled in water or milk. When the decoction is sufficiently concentrated, it gelatinizes on cooling. It may be flavoured with sugar, lemon peel, white wine, or aromatics, and then forms a very agreeable kind of diet.

Decoctum Cetrariæ, Ph. Lond.—Iceland moss, ℥v.; water, Ojss.; boil down to a pint, and strain. The dose is from f℥j. to f℥iv. every four or six hours. The *Dec. Lichenis Islandici*, Ph. Edinb., is prepared by boiling ℥j. of the moss with ℔ij. of water to 16 ounces. The Dublin college orders half an ounce of the moss to be digested for two hours in a close vessel with a wine-pint of boiling water, then to be boiled for fifteen minutes, and the liquor strained while hot.

Rocel'la tincto'ria, De Cand. L.D.—*Dyer's Or'chil* or *Orchel'la.*

Sex. Syst. Cryptogamia, Algæ.

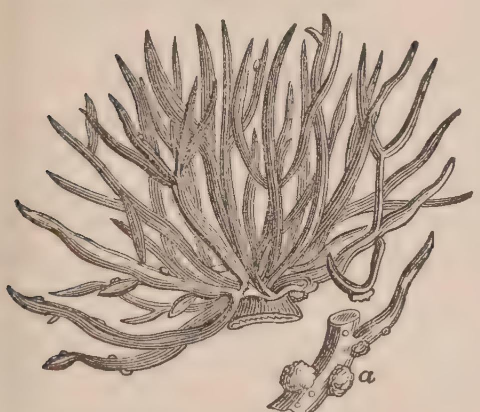
(Lacmus: Thallus præparatus, *Ph. Lond.* Litmus, *Ph. Dubl.*)

History.—It is the πόντιον φύκος (*Fucus marinus*) of Theophrastus (*Hist. Plant.* lib. iv. cap. 7). By the moderns it was first employed as a dye at the commencement of the fourteenth century (Beckmann, *Hist. of Invent. and Discov.* i.)

Botany. *Gen. Char.*—*Thallus* coriaceo-cartilaginous, rounded or plane, branched or laciniated. *Apothecia* orbicular, adnate with the thallus; the disk coloured, plano-convex, with a border at length thickened and elevated, formed of the thallus, and covering a sublentiform, black, compact, pulverulent powder concealed within the substance (*Hooker*).

Sp. Char.—*Thallus* suffruticose, rounded, branched, somewhat erect, greyish brown, bearing powdery warts. *Apothecia* flat, almost black and pruinose, with a scarcely prominent border (*Hooker*).

Fig. 72.



Rocella tinctoria.
a. Warts on the thallus.

Hab.—Maritime rocks of the Canaries, Azores, southern coast of England, &c.

Commerce.—It is imported in bags from the Canaries (*Canary Weed*), the Azores (*Western Island Weed, St. Michael's Weed*), Cape de Verde Islands and Mogadore (*African* or *Mogadore Weed*). That from the Canaries is the most valuable. In 1838, 567 cwts. of *Rocella tinctoria* and *fuciformis* paid duty.

Physical Properties.—Both Rocella tinctoria and fuciformis are imported as orchil. I have met with the latter species in commerce under the name of *Madeira Weed*. It is distinguished from R. tinctoria by its larger size, its paler colour, and its broader flat fronds.

Composition.—Rocella tinctoria was analyzed by Fr. Nees v. Esenbeck, who found in it a *brown resin* (soluble in alcohol and ether, and becoming brownish red with ammonia), *wax, glutinous matter, insoluble starch, yellow extractive, yellowish brown gummy matter, lichenin, tartrate* and *oxalate of lime*, and *chloride of sodium* from the adherent sea water (Nees v. Esenbeck and Ebermaier, *Handb. d. med. pharm. Bot.* Bd. 1.)

The substance which, under the influence of ammonia and air, yields the purple colouring matter of this plant, has been denominated, by Heeren (Thomson's *Org. Chem.* 401), *erythrin*. It is white, tasteless, odourless, fusible, combustible, insoluble in ether, soluble in 170 parts of boiling water, and more soluble in alcohol. The same chemist has also obtained from this plant a crystalline fatty acid (*rocellic acid*), composed of $C^{17} H^{16} O^{4}$.

Chemical Characteristics.—The aqueous decoction of Rocella tinctoria forms a copious precipitate with diacetate of lead, and has its colour deepened by alkalies. Digested in a weak solution of ammonia, in a corked phial, at a heat not exceeding 130° F., this plant yields a rich violet-red colour. This is *Hellot's test* for the discovery of a colorific property in lichens (Berthollet, *On Dyeing*, by Ure, vol. ii. p. 184; also, *Proceedings of Comm. of Agric. of Asiatic Soc.*, April 8, 1837).

PREPARATION OF ORCHIL.—Rocella tinctoria has been introduced into the London Pharmacopœia as the source of *litmus;* but this substance, though formerly procured from Rocella, according to Ferber (Murray, *App. Med.* iv. 144), is now prepared from Lecanora tartarea (Nees and Ebermaier, *Handb.* i. 49; also Thomson, *Org. Chem.* 384).

Orchil or *Archil* is the only colouring matter prepared from Rocella tinctoria in this country. *Blue Orchil* is procured by steeping the lichens in an ammoniacal liquor in a covered wooden vessel. *Red Orchil* is made with the same liquor in common earthen jars placed in a room heated by steam, and called *a stove.* In one manufactory which I inspected, the ammoniacal liquor was prepared by distillation from a mixture of lime, impure muriate or sulphate of ammonia obtained from gas-works, and water; but I am informed, that some makers still employ stale urine and lime.

PROPERTIES AND USES.—The liquor sold in the shops as orchil has a deep reddish purple colour and an ammoniacal smell. It is reddened by acids like litmus. It is employed for dyeing, colouring, and staining.

Lecano'ra tarta'rea, Ach.—*Tarta'reous Moss.*

Sex. Syst. Cryptogamia, Algæ.

(Litmus, *Offic.*)

HISTORY.—The manufacture of a colouring matter from this plant was first started at Leith by Dr. Cuthbert Gordon, from whose name the word *Cudbear* originated.

BOTANY. *GEN. CHAR.*—*Thallus* crustaceous, spreading, plane, adnate, uniform. *Apothecia* (*patellulæ*) orbicular, thick, sessile, and adnate; the *disk* plano-convex; its *border* thickish, formed of the *crust* and of the same colour (*Hooker*).

SP. CHAR.—*Crust* thick, granulated, and tartareous greyish white. *Apothecia* scattered; the *disk* convex, at length plane or tumid yellow-brown, inclining to flesh colour; the *border* thick, inflexed, at length wavy (*Hooker*).

FIG. 73.

Lecanora tartarea.

HAB.—On rocks in Alpine countries, Norway, Scotland, &c.

COMMERCE.—It is imported from Norway and Sweden under the name of *white Swedish* or *tartareous moss.*

PREPARATION OF CUDBEAR AND LITMUS.—In this country, *red* and *blue cudbear* (in the form both of *powder* and *paste*) are prepared from this plant. In Holland, *litmus* is made from it, according to Nees and Ebermaier (*op. cit.*), and Thomson (*op. cit.*)

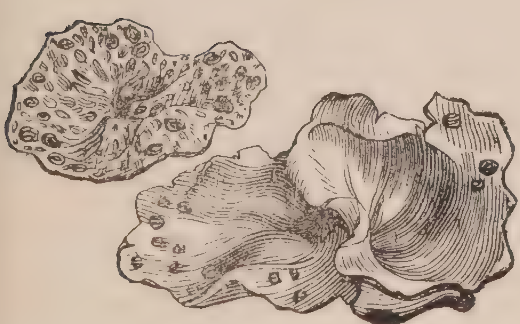
Cudbear (Persio) is procured in the manner of orchil, by the action of ammonia. When colour is developed, the decomposed lichen is sold either as paste, or dried and ground into powder.

Litmus (*Lacmus*, Ph. L.; *Litmus*, Ph. Dub.; *lacca cærulea, lacca musica*) is made by the Dutch, and is imported from Holland. Guibourt *(Hist. des Drog.* 3me éd. ii. 143) thinks that it owes its colour to the *Crozophora tinctoria.* But on a microscopic examination of the litmus cakes of commerce, portions of the epidermis and meso-thallus of some lichen are found. My colleague, Mr. Quekett, who has carefully examined them, cannot decide whether they be the tissues of Rocella or of Lecanora. The precise mode of obtaining litmus is not known; but there is little doubt the process is somewhat analogous to that for making orchil. The lichen is said to be fermented in putrid (distilled?) urine. The substance which yields the blue colour is either identical with, or very analogous to, *erythrin*.

PROPERTIES AND USES OF LITMUS.—Litmus occurs in small, cubical, light, and friable cakes of a dirty blue colour. Examined by the microscope, we find sporules, and portions of the epidermis and meso-thallus of some species of lichen, moss leaves, silica, &c. When the cakes are thrown into dilute hydrochloric acid, effervescence takes place, and a solution of chloride of calcium is obtained, shewing that they contain carbonate of lime. The blue colouring matter of litmus is soluble in both water and alcohol. It is reddened by acids, but restored by alkalies. Chlorine and the hypochlorites destroy it. *Tincture of Litmus* is prepared by digesting one part of litmus in about twenty-five parts of water. *Blue test paper* (*charta exploratoria cærulea*, Ph. Bor.) is made with bibulous or unsized paper, which is to be brushed over with, or immersed in, a filtered infusion of litmus (composed of one part litmus and four parts water), and when carefully dried, preserved in a well-stopped vessel in a dark cupboard. Both tincture and paper are used as tests for free acids: the former requires to be diluted before it is employed.

Other Esculent and Medicinal Lichens.

FIG. 74.



Tripe de Roche.

FIG. 75.

Cladonia rangiferina.

Several species of *Gyrophora* (as *G. proboscidea* and *cylindrica*) are employed by the hunters of the Arctic regions of America as articles of food, under the name of *tripe de roche* (fig. 74). They supported Capt. Sir John Franklin and his companions in 1821 for many days. The bitter principle proved noxious to several of the party (*Narrative*, 408). *Cladonia rangiferina* or *rein-deer moss* (fig. 75) is a well-known example of a nutritive lichen, supporting the animals after whom it is named when no other sustenance can be obtained.

Several lichens are employed as popular remedies for hooping-cough and pulmonary affections. Those usually kept by the herbalist are, *Sticta pulmonaria* (called *oak lungs*), *Scyphophorus pyxidatus* (*cup moss*), and *Peltidea canina* (sold as *ground liverwort*). The latter was formerly thought to be a specific for hydrophobia.

ORDER 3. FUN'GI, *Juss.*—THE MUSHROOM TRIBE.

FUNGACEÆ, *Lind.*

ESSENTIAL CHARACTER.—*Plants* consisting of *cells* and *fibres*, always springing from organized, and generally decayed or decaying substances, not perfected when immersed in water, bearing reproductive *sporidia*, either externally or internally, naked or inclosed in variously-formed cells, many of which frequently concur in the reproduction of a single individual, varying extremely in substance and duration, generally soft and juicy, sometimes exceedingly hard, with or without a central gelatinous nucleus, or dry and powdery *(Berkeley)*.

PROPERTIES.—Extremely variable: some fungi being highly nutritious, others very deleterious. No anatomical characters are known by which the poisonous can be distinguished from the esculent ones. A few species only have been used in medicine, and these are not uniform in their properties. The proximate principles peculiar to this order which have been examined are—1, *Fungin*, a nitrogenous, highly-nutritious woody matter; 2, *Amanitin*, the active ingredient of some of the poisonous Agarici; 3, *Boletic acid*; 4, *Fungic acid*. Mushroom sugar has been found identical with mannite. The active principle of ergot of rye *(ergotin)* may not perhaps reside in the fungus *(Ergotætia abortifaciens)*, but in the morbid growth which it gives rise to.

Ergotæ'tia abortifa'ciens, Pereira.—*The abor'tifacient Ergotæ'tia.*

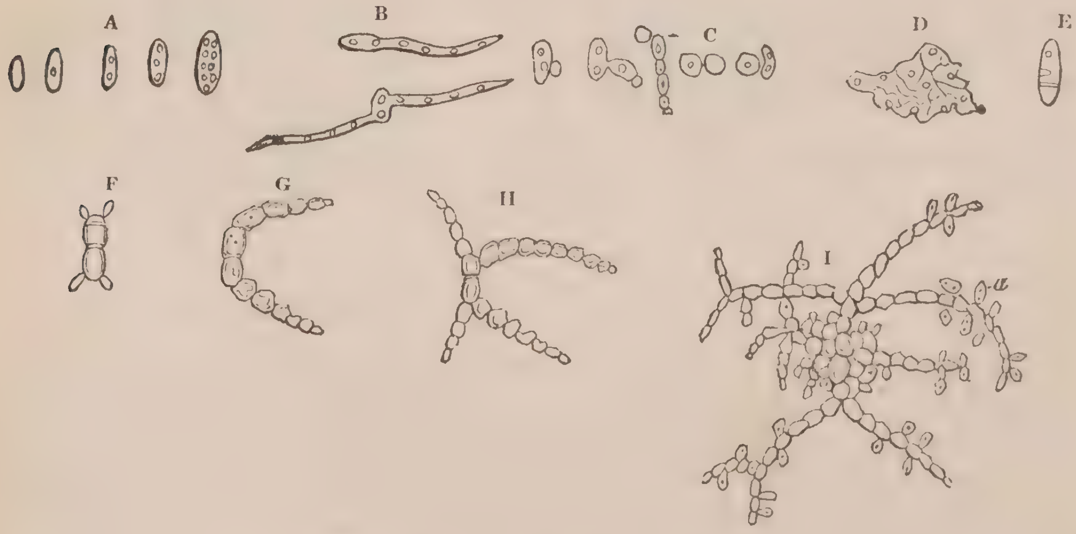
Sex. Syst. Cryptogamia, Fungi.

(Ergota, *Offic.*)

HISTORY.—This fungus was first described and named by my colleague, Mr. Quekett, in a paper read before the Linnean Society, Dec. 4, 1838. An abstract of the paper was published in the *Lond. Med. Gaz.* (xxiii. p. 606). Mr. Quekett named the plant *Ergotætia abortans* (*Ergotætia*, from *Ergot*, Fr., *Ergota*, Ph. Lond., and *αἰτία*, *origin; abortans*, in allusion to its destroying the germinating power of the grain of grasses, and also to the medicinal powers of ergot). The sporidia of the plant are depicted by Phœbus (*Deutschl. kryptog. Giftgewächse*, Taf. ix.). They were also noticed by Phillipar (*Traité Organogr. et Physiologico-agric. sur l'Ergot*).

BOTANY. *GEN. CHAR.*—*Sporidia* agglutinated to surface of matrix,

FIG. 76.



Different views of *Ergotætia abortifaciens.*

A, sporidia. B, C, E, F, G, H, different modes of reproduction. D, membrane of sporidium laid open. I, the fungus assuming a radiated form, and beginning to develop sporidia upon its branches.

oval or elliptical, pellucid, seldom containing more than two or three well-defined granules (*sporidiola?*). *Flocci*, few, sometimes ramifying or sporidiferous (*Quekett*).

Sp. Char.—Only one species known.

Hab.—Floral envelopes, and ovaria of grasses: Europe, America.

Sometimes the sporidia are slightly contracted about their middle. They contain usually one, two, or three, but occasionally as many as ten or twelve, well-defined green granules. The sporidia are, on the average, about 1-4000th of an inch long, and 1-6000th of an inch broad. When placed on glass and moistened with water, they readily germinate or produce other plants, though in various ways, as sometimes by emitting tubes (B); by the development of buds (C); and by the formation of septa across their interior (E, F, G, H) (*Quekett*). This plant belongs to the *Coniomycetes* of Fries, tribe *Mucedines;* and to the *Hyphomycetes* of Berkeley, tribe *Sepedoniei*.

By the growth of these fungi upon or within the ovarium of grasses, a diseased condition of the ovarium, involving the whole of the embryo, and sometimes partially or wholly the albumen, is produced, called the *ergot* or *spur*, which will be described hereafter [*vide* Gramineæ].

Properties.—The chemical properties and physiological effects of this fungus are at present quite unknown. We have yet to learn, whether the peculiar properties of ergoted grasses depend on the fungi, or on the morbid products of the ovarium.

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1. *Fungi esculenti.—Esculent Fungi.*

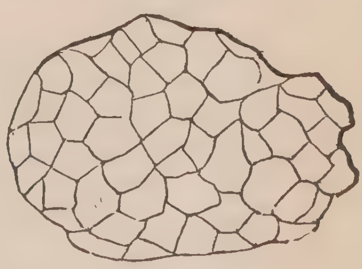
Fig. 77.

Agaricus campestris.

Fig. 78.

Morchella esculenta.

Fig. 79.



Tuber cibarium.

Though a considerable number of species of fungi are edible—in fact several form delicious articles of food—a small number only is in common use in this country. This has arisen, in a great measure, from the difficulty experienced by the public in discriminating wholesome from poisonous species. Nay, it would appear that the same species is under some circumstances edible, under others deleterious. This, if true, is a very proper ground for distrust. "So strongly did the late Professor L. C. Richard feel the prudence of this, that although no one was better acquainted with the distinctions of fungi, he would never eat any, except such as had been raised in gardens in mushroom beds" (Lindley, *Nat. Syst. of Bot.* 2d edit. p. 422). The edible species in most common use in this country are, 1st. *Agaricus campestris*, fig. 77 (*common field* or *cultivated mushroom*), which, in the adult state, is employed in the preparation of ketchup, and is eaten fresh, either stewed or broiled: the young or button mushroom is pickled. 2dly. *Morchella esculenta*, fig. 78 (*common morel*), employed to flavour gravies, ragouts, &c. 3dly. *Tuber cibarium*, fig. 79 (*common truffle*), a subterraneous fungus, used for seasoning. No less than thirty-three species are eaten in Russia (Dr. Lefevre, *Lond. Med. Gaz.* xxiii. 414).

2. *Fungi occasionally used in Medicine.*

Polyporus igniarus (*Boletus igniarus*, Ph. Ed.), commonly called *agaric of the oak*, *touchwood*, or *spunk*, is still retained in the Edinburgh Pharmacopœia. The internal portion, cut in thin slices, and beaten with a hammer until soft, has been applied, as a styptic, to restrain hæmorrhages; but its action is mechanical, like lint: that is, it absorbs the blood, and promotes coagulation. *Polyporus fomentarius (real Amadou)* has also been used for similar purposes. The substance sold in the shops as *Amadou*, or *German tinder*, is prepared from both species, by cutting the fungus in slices, beating, and soaking it in a solution of nitre. *Polyporus Laricis (P. officinalis, Boletus purgans*, or *Larch agaric*) was formerly used as a drastic purgative, in doses of from a scruple to two drachms, and it is still kept by the herbalist. Mr. Butler, of Covent Garden Market, informs me that it is imported from Germany, but that there is very little sale of it. The dust *(sporidia)* of *Lycoperdon (Puff ball)* was formerly used as a styptic; the smoke is used for stupefying bees.

3. *Fungi venenati.—Poisonous Fungi.*

Fig. 80.

Poisonous Indigenous Agarici of the section Amanita.

a, Agaricus vernus, *Bull.*
b, „ phalloides, *Fries.*
c, „ porphyrius, *Fries.*
d, „ vaginatus, *Bull.*
e, Agaricus nivalis, *Grev.*
f, *f*, „ muscarius, *Linn.*
g, „ pantherinus, *Dec.*

All poisonous fungi are called by the public *toadstools*. Those of the genus *Agaricus*, section *Amanita*, are the most important, because the most likely to be confounded with edible species (as with *Agaricus campestris*). The Russians, who eat no less than sixteen species of Agaricus (Dr. Lefevre, *Lond. Med. Gaz.* xxiii. 414), never employ any belonging to the section *Amanita*.

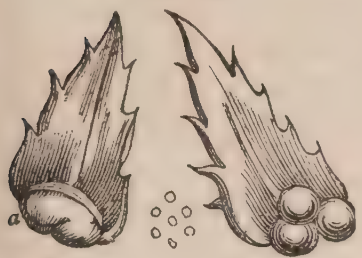
The symptoms produced by poisonous fungi are those indicating gastro-intestinal irritation (nausea, vomiting, purging, and abdominal pain), and a disordered condition of the nervous system (delirium, stupor, blindness, convulsions, muscular debility, paralysis, drowsiness). In some cases, the power of the vascular system is remarkably depressed, the pulse being small and feeble, the extremities cold, and the body covered with a cold sweat. At one time, local irritation only; at another, narcotism alone is produced. (For illustrations of the effects of particular species, see p. 15 of this work, and consult Phœbus, *Deutschl. kryptog. Giftgewächse*, 1838; and Letellier, *Journ. de Pharm.* Août 1837).

In some cases the active principle of poisonous fungi seems to be a *volatile acrid principle:* in other instances it is a brown, uncrystallizable solid, called by Letellier *amanitin.*

No specific antidote is known. The first object, therefore, is to expel the poison from the stomach and bowels. The subsequent treatment will depend on the nature of the symptoms which manifest themselves, and must be conducted on general principles. For further information respecting poisonous fungi, consult Christison's *Treatise on Poisons*).

ORDER 4. LYCOPODIA'CEÆ, *De Cand.*—THE CLUB-MOSS TRIBE.

FIG. 81.



Fructification of Lycopodiaceæ.

The powder sold in the shops as *Lycopodium*, *witch-meal*, or *vegetable sulphur*, is procured from *Lycopodium clavatum (common club-moss)*. It consists of extremely small pale yellow particles, fig. 81, *b* (*sporules? pollen??*) which, in the plant, are contained in two valved, one-celled capsules, *a* (*thecæ*, *sporangia? anthers??*) lodged, in the axillæ of the bracteal leaves. It is sometimes employed in medicine as a dusting powder for children; and, in pharmacy, for enveloping pills to prevent their adhesion.

ORDER 5. FIL'ICES, *Juss.*—THE FERN TRIBE.

(Filicales, *Lind.*)

ESSENTIAL CHARACTER.—Herbaceous plants with a perennial *rhizome*, more rarely having an erect arborescent trunk [when they are called tree ferns, *filices arboreæ*; fig. 82]: *trunk* coated, of a prosenchymatous structure, with the entire cylinder of woody fasciculi divided into two concentric parts, the one narrow, placed between the bark and the wood, the other larger, central, medullary, sending fasciculi of vessels towards the petioles, and communicating with the exterior by means of chinks in the woody cylinder. *Leaves* [*frondes*] scattered upon the rhizome or rosaceo-fasciculate on the apex of the caudex, with circinnate vernation, annual or perennial, the base of the petioles persistent, growing to the caudex; simple or pinnate, entire or pinnatified, [equal-]veined, (the veins composed of elongated cells), frequently having cuticular *stomata*. *Sporangia* [*thecæ*], placed on the veins of the back or margin of the leaves, collected in little naked heaps [*sori*], or covered with a membranous scale [*indusium*], or transmuted margin of the leaf, pedicellate [with the stalk (*seta*), passing round them in the form of an elastic ring (*annulus*)], or sessile, unilocular, indefinitely dehiscent. *Spores* [*sporulæ*] numerous, free, globose, or angular, in germination at first elongated in every direction, throwing out radicles downward, and the cauliculus upward (Endlicher, *Gen. Plant*).

FIG. 82.

A Tree Fern.

PROPERTIES.—The leaves are mucilaginous, and frequently slightly astringent and aromatic. The rhizomes contain starch, usually tannic acid with more or less bitter matter, and sometimes both fixed and volatile oil, with some resin. They are mild, astringent tonics. The rhizome of *Nephrodium Filix mas* is celebrated as a vermifuge; that of *Polypodium Caliguala* as a diaphoretic and diuretic in rheumatic and venereal diseases (vide Lambert's *Illustr. of the genus Cinchona*, p. 125, 1821).

Nephro'dium Fi'lix mas, Richard (Aspidium Filix mas, L. E. D.)—*Male Shield Fern.*

Sex. Syst. Cryptogamia, Filices.

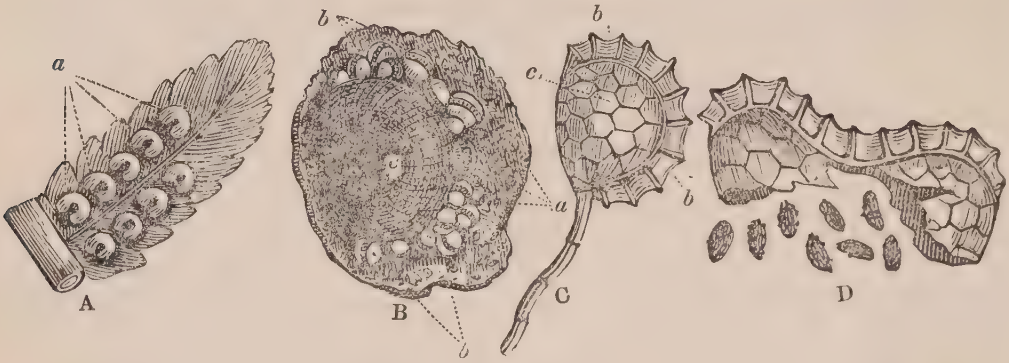
(Aspidium: radix, *Ph. Lond.;* radix, *Ph. Dubl.;* Aspidii Filicis maris radix, *Ph. Ed.*)

History.—This plant was known to Theophrastus, Dioscorides, and Pliny. The two first call it πτέρις, the latter *Filix mas.*

Botany. *Gen. Char.*—*Sori* roundish, scattered. *Indusium* orbiculari-reniform, fixed by the sinus.

Sp. Char.—*Fronds* bipinnate, pinnules oblong, obtuse serrated, their stalks and midrib chaffy. *Sori* near the central nerve (*Hooker*).

Fig. 83.



Nephrodium Filix mas.

A. Pinnule with nine sori (*a*).
B. Magnified portion of pinnule with the sporangia. *a.* Stomata. *b. b.* Sporangia partially covered by *c.* the indusium.
C. Magnified sporangium. *a.* Stalk. *b.* Ring. *c.* Membranous sac.
D. Ruptured sporangium, with the sporules escaping.

The rhizome is large, tufted, and scaly. The leaves grow in a circle to a height of 3 or 4 feet.

Hab.—It is an indigenous plant, frequent in woods and on shady banks. It is a native of other parts of Europe, of Asia, of the North of Africa, and of the United States of America.

Description.—The subterraneous stem (*rhizoma; caudex; fern root, radix filicis*, officin.) lies obliquely in the ground. It varies in length and breadth according to its age. For medicinal purposes it should be from three to six or more inches long, and from half an inch to an inch or more broad. It is almost completely enveloped by the thickened bases of the footstalks of the fallen leaves. These bases (sometimes called tubercles) are arranged closely around the rhizome in an oblique direction, overlapping each other. They are one or two inches long, from three to five lines thick, curved, angular, brown, surrounded near their origin from the rhizome by two or more shining, reddish yellow, thin, silky scales *(ramenta).* The radicle fibres (root, properly so called) arise from the rhizome between these footstalks. The fern root of the shops consists of fragments of the dried thickened bases of the footstalks, to which small portions of the rhizome are found adhering, and of the root fibres.

Internally, the rhizome and footstalks are, in the recent state, fleshy, of a light yellowish-green colour; but in the dried state, yellowish or reddish white. Iodine colours the fresh rhizome bluish black, indicating the presence of starch, particles of which may be recognized by the microscope. In a transverse section of the rhizome we observe five or six or more bundles of woody fibres and scalariform ducts. These bundles are arranged in a circle, are of a reddish white colour in the recent rhizome, but yellow in the dried one.

The dried root has a feeble, earthy, somewhat disagreeable odour. Its taste is at first sweetish, then bitter astringent, and subsequently nauseous, like rancid fat.

Collection.—The rhizome should be collected in the month of July, August, or September. The black portions, fibres, and scales, are to be removed, and the sound parts carefully dried and reduced to powder: this is of a yellowish colour, and is to be preserved in well-stoppered bottles. Both the whole rhizome and powder deteriorate by keeping.

Composition.—Fern rhizome was analysed in 1805 by Vauquelin (*Ann. Chim.* lv. 31), in 1821 by Gebhard (*Diss. inaug.* in Pfaff's *Syst. d. Mat. Med.* 7er Bd. 219), in 1824 by Morin (*Journ. de Pharm.* x. 223), in 1826 by Wackenroder (*De Anthelm. regni Vegetab.*), and by Geiger (*Handb. d. Pharm.* 1829). Subjoined are the results of the analyses of Geiger and of Morin:—

Geiger.

Green fat oil	6·9
—— resin	4·1
Uncrystallizable sugar } Easily oxidizable tannin }	22·9
Gum and salts, with sugar and tannin	9·8
Ligneous fibre and starch	56·3
	100·0

Morin.

Volatile oil.
Fixed oil (stearin and olein).
Tannin.
Gallic and acetic acids.
Uncrystallizable sugar.
Starch.
Gelatinous matter, insoluble in water and alcohol.
Ligneous fibre.
Ashes (carbonate, sulphate, and hydrochlorate of potash, carbonate and phosphate of lime, alumina, silica, and oxide of iron).

The anthelmintic property of the rhizome resides in the oil (*oleum filicis maris*). Batso (*Inaug. Diss.* 1826, quoted in Goebel and Kunze's *Pharm. Waarenk.*) found a peculiar acid (*acidum filiceum*) and an alkali (*filicina*) in the rhizome.

Characteristics.—The presence of tannic acid in the aqueous decoction of fern rhizome is shown by the sesquisalts of iron producing a dark green colour (*tannate of iron*), and by a solution of gelatin causing a yellowish precipitate (*tannate of gelatin*). No indication of the presence of a vegetable alkali in the decoction, can be obtained by tincture of nutgalls. If the rhizome be digested in alcohol, and afterwards boiled in water, the decoction when cold forms, with a solution of iodine, a dingy blue precipitate (*iodide of starch*).

Physiological Effects.—These are not very obvious; but they are, probably, similar to those caused by other astringents. Large doses excite nausea and vomiting.

Uses.—It is only employed as an anthelmintic. Theophrastus, Dioscorides, Pliny, and Galen, used it as such. The attention of modern practitioners has been directed to it principally from the circumstance of its being one of the remedies employed by Madame Nouffer, the widow of a Swiss surgeon, who sold her secret method of expelling tape-worm to

Louis XVI. for 18,000 francs (*Trait. contre le Tænia*, &c. 1776, quoted by Bremser, *Sur les Vers Intest.*) At the present time fern rhizome is but seldom employed in this country, partly because the efficacy of Madame Nouffer's treatment is referred to the drastics used, and partly because other agents (especially oil of turpentine) have been found more effectual. "It is an excellent remedy," says Bremser (*op. cit.* p. 422), "against *Bothriocephalus latus* [the tape-worm of the Swiss], but not against *Tænia Solium* [the tape-worm of this country]; for though it evacuates some pieces of the latter, it does not destroy it."

Administration.—It may be administered in the form of powder, of oil or ethereal extract, or of aqueous decoction. The dose of the recently prepared powder is from one to three drachms. Madame Nouffer's *specific* was two or three drachms of the powder taken in from four to six ounces of water in the morning fasting, and two hours afterwards a *purgative bolus*, composed of calomel ten grains, scammony ten grains, and gamboge six or seven grains. The bolus was exhibited to expel the worm which the fern rhizome was supposed to have destroyed.

Oleum Filicis Maris. Oil of Male Fern.—The impure oil of fern (called *oleum filicis Peschieri*, *extractum filicis æthereum*, seu *balsamum filicis*), recommended by Peschier (*Journ. génér. de Méd.* 1825, p. 375) is an ethereal extract, and is composed, according to its proposer, of a *fatty matter*, *resin*, *volatile oil*, *colouring matter*, *extractive*, *chloride of potassium*, and *acetic acid*. A pound of the rhizome yielded Soubeiran (*Nouv. Traité de Pharm.* ii. 214) an ounce and a half of thick black oil, having the aromatic odour of fern. The dose is from half a drachm to a drachm, in the form of electuary, emulsion, or pills: an hour afterwards, an ounce or an ounce and a half of castor oil should be exhibited. Numerous testimonies of its efficacy have been published (see Dierbach, *Neuest. Entd. in d. Mat. Med.* 1er Band, 1837). By substituting alcohol for ether, twelve or thirteen drachms of oil can be obtained from $2\frac{2}{3}$ lbs. of the rhizome (*Journ. de Chim. Méd.* v. 2nde Sér. 68).

Division II. Phanerogamia, *Auct.*—Flowering Plants.

Cotyledoneæ, *Juss.*—Embryonatæ, *Rich.*—Vasculares, *Dec.*

Essential Character.—Substance of the plant composed of cellular tissue, woody fibre, ducts, and spiral vessels. *Leaves* usually present: *cuticle* with stomata. *Flowers* with perceptible stamens and pistils. *Seeds* generally with an embryo enclosed within a spermoderm, furnished with one or more cotyledons.

1. RHIZANTHEÆ, *Blume.*—RHIZANTHS.

Essential Character.—Parasitical leafless plants. *Stem* homogeneous. Vascular system scarcely present. *Flowers* propagated by the agency of sexes. *Seeds* having no embryo, but consisting of a homogeneous sporuliferous mass (*Lindley*).

Order 6. Rafflesiaceæ, *Endl.*

Fig. 84.

Rafflesia Arnoldi.

In this Order is contained the *Rafflesia Arnoldi* (fig. 84), one of the wonders of the vegetable world. The diameter of its flower is 3½ feet, the weight 15 lbs. The hollow in its centre is capable of holding twelve pints! It grows in Java, on the stems and roots of *Cissus angustifolia* (vide *Trans. Linn. Society*, vol. xiii.)

A decoction of this plant is used in Java as an astringent application in relaxed conditions of the vagina.

2. ENDOGENEÆ, *De Cand.*—ENDOGENS.

MONOCOTYLEDONES, *Juss.*

Fig. 85.

Endogens, or *Monocotyledons.*

q. Transverse section of an endogenous stem, shewing the absence of medullary rays and of annual layers.
u. Stem and leaves of an endogen, showing the alternated sheathing leaves, with parallel veins.
r. Germinating seed of *Tradescantia cristata*, showing the plumule rupturing the coleoptilum, with the radicle and radicels.
s. Section of a germinating seed, showing the cotyledon remaining in the testa.
t. Germinating embryo of a grass, to show the two alternate cotyledons of unequal size, with the intermediate plumule.

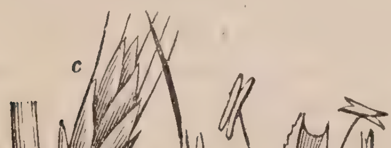
Essential Character.—*Trunk* usually cylindrical, when a terminal bud only is developed, becoming conical and branched when several develope; consisting of cellular tissue, among which the vascular tissue is mixed in bundles, without any distinction of bark, wood, and pith, and destitute of medullary rays; increasing in diameter by the addition of new matter to the centre. *Leaves* frequently sheathing at the base, and not readily separating from the stem by an articulation, mostly alternate, with parallel simple veins, connected by smaller transverse ones. *Flowers* usually having a ternary division; the calyx and corolla either distinct or undistinguishable in colour and size, or absent. *Embryo* with but one cotyledon; if with two, then the accessory one is imperfect, and alternate with the other; *radicle* usually enclosed within the substance of this embryo, through which it bursts when germinating (*Lindley*).

Order 7. Gramin'eæ, *R. Brown.*—The Grass Tribe.

(Gramina, *Juss.* Graminaceæ, *Lind.*)

Essential Character.—*Flowers* usually hermaphrodite, sometimes monœcious or polygamous; consisting of imbricated bracts, of which the most exterior are called *glumes*, the interior immediately enclosing the stamens *paleæ*, and the innermost at the base of the ovarium *scales*. *Glumes* usually two, alternate; sometimes single; most commonly unequal. *Paleæ* two, alternate; the lower or exterior, simple; the upper or interior composed of two, united by their contiguous margins, and usually with two keels—together forming a kind of dislocated calyx. *Scales* two or three, sometimes wanting; if two, collateral, alternate with the paleæ, and next the lower of them, either distinct or united. *Stamens* hypogynous, one, two, three, four, six, or more, one of which alternates with the two hypogynous scales, and is, therefore, next the lower palea; *anthers* versatile. *Ovary* simple; *styles* two, very rarely one or three; *stigmas* feathery or hairy. *Pericarp* usually undistinguishable from the seed, membranous. *Albumen* farinaceous; *embryo* lying on one side of the albumen at the base, lenticular, with a broad cotyledon and a developed plumule; and occasionally, but very rarely, with a second cotyledon on the outside of the plumule, and alternate with the usual cotyledon. *Rhizoma* fibrous or bulbous. *Culms* cylindrical, usually fistular, closed at the joints, covered with a coat of silex. *Leaves* alternate, with a split sheath. *Flowers* in little spikes, called *locustæ*, arranged in a spiked, racemed, or panicled manner (*Lindley*).

Fig. 86.



Flowers of Grasses.

a. The *ovarium* (with the two *scales* at the base), surmounted by two feathery *stigmata*.
b. Two *glumes* (the outermost furnished with an awn —the innermost has a notch at the top, indicating it is formed of two glumes), and three *stamina*.
c. *Spikelet*, or *locusta*.

Properties.—Almost every species is esculent and salubrious. The nutritive property is especially remarkable in the seeds of grasses, which contain *starch*, *gluten*, *gum*, and *sugar*. The stems and leaves also contain sugar, mucilage, and starch. Cane-sugar is procured from the stem of a grass. Both stems and leaves are used as food for cattle. Even the subterraneous stems and roots of some species (as *Triticum repens* and *Cynodon Dactylon*) abound in these principles. Considered in a medicinal point of view, the products of the grasses are emollient and demulcent.

To these statements there are a few exceptions, some of which have been already noticed (p. 3).

Odorous volatile oil is found in some species; as in *Anthoxanthum odoratum; Andropogon muricatus*, the fibrous roots of which are sold by perfumers under the Tamool name of *Vittie Vayr; Andropogon Schœnanthus*, which yields the *oil of lemon-grass;* and *Andropogon Calamus aromaticus*, Royle (*A. nardoides*, Nees ab Esenb.), from which the *grass-oil of Namur* is obtained (Royle's *Essay on the Antiq. of Hindoo Med.* p. 34).

Sac'charum Officina'rum, Linn. E. D. (S. officinale, L.)—*The Sugar Cane.*

Sex. Syst. Triandria, Digynia.

(Sacchari fæx; Saccharum: Succus præparatus, *Ph. Lond.* Succus concretus, *a.* non purificatus, *b.* purificatus; Syrupus empyreumaticus, anglicè *molasses*, *Ph. Dub.* Saccharum non purificatum; Saccharum purissimum; Syrupus empyreumaticus, *Ph. Ed.*)

History.—The manufacture of sugar is said by Humboldt to be of the highest antiquity in China. Cane sugar was known to the ancient Greeks and Romans, and was considered by them to be a kind of honey. Possibly, Herodotus (*Melpomene*, cxciv.) refers to it when he says that the Zygantes make honey in addition to that which they get from bees. Theophrastus (*De Melle*) calls it *mel in arundinibus*; Dioscorides (lib. ii. cap. civ.) σάκχαρον; Pliny (*Hist. Nat.* lib. xii. cap. xvii) *saccharum.* Humboldt (*Journ of Science and Arts*, vol. v. p. 51) adopts too hastily, I hink, the opinion of Salmasius, that the latter writers meant the siliceous roduct of the Bamboo, viz. *tabasheer;* for, in the first place, as they rrange it with honey, it was probably sweet, which tabasheer is not; econdly, the Sanscrit name for sugar is *sarkura* (Royle's *Essay*, p. 83); hirdly, a passage in Lucan (iii. 237) seems distinctly to refer to the ugar cane—"Quique bibunt tenera dulces ab arundine succos." Surely o one will pretend that the bamboo is a "tenera arundo?" (References o passages in other ancient authors will be found in the notes to Valpy's dit. of Pliny's *Hist. Nat.* vol. iv. 2193.)

BOTANY. *GEN. CHAR.*—*Spikelets* all fertile, in pairs, the one sessile, he other stalked, articulated at the base, two-flowered, the lower floret euter, with one palea, the upper hermaphrodite, with two paleæ. *Glumes* two, membranous. *Paleæ* transparent, awnless, those of the ermaphrodite flower minute, unequal. *Stamens* three. *Ovary* smooth. *Styles* two, long; *stigmas* feathered, with simple toothletted hairs. *Scales* two, obscurely two or three-lobed at the point, distinct. *Caryopsis* smooth (?), loose (?) (*Kunth*).

SP. CHAR.—*Panicle* effuse. *Flowers* triandrous. *Glumes* obscurely one-nerved, with very long hairs on the back (*Kunth*).

FIG. 87.

Saccharum officinarum.

FIG. 88.

S. offic.
β) *purpureum.*

The stem is solid, from six to twelve feet high. Leaves flat. Panicle terminal, from one to three feet long, of a grey colour, from the long soft hair that surrounds the flower. Paleæ rose-coloured. Four varieties of the sugar cane are admitted: α) *commune*, with a yellow stem; β) *purpureum* (fig. 88), with a purple stem, yielding a richer juice; γ) *giganteum*, with a very large light-coloured stem; δ) *tahitense*, from Otaheite, said to make the finest sugar (Porter's *Nat. and Prop. of the Sugar Cane*, p. 28, 1830).

HAB.—It is cultivated in both Indies. Its native country is uncertain.

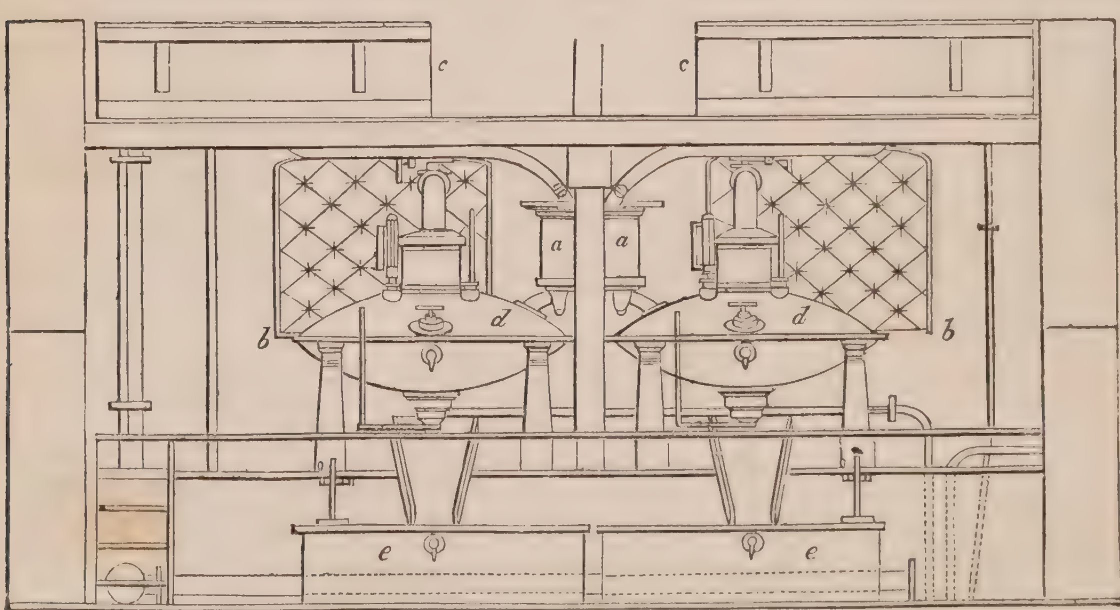
MANUFACTURE OF SUGAR.—The canes, when ripe, are cut close to the ground, stripped of leaves, and carried in bundles to the mill-house, where they are twice subjected to pressure between iron rollers, placed either vertically or horizontally. The *cane-juice* thus procured is an opaque liquid, of an olive green colour, saccharine taste, and balsamic odour. Its specific gravity is 1·033 to 1·106. It consists of *water*, *sugar*, *gum*, *green fecula*, *extractive*, *gluten*, *acetic and malic acids*, *acetates of lime and potash*, *super-malate and sulphate of lime*, and *lignin*, in the form of fragments of the cellular and fibrous tissues of the canes.

From the mill the juice is conveyed to a copper cauldron, called the *clarifier*, where it is mixed with lime, and heated. The clear liquor is then drawn off and put into a copper *boiler*, where it is evaporated and skimmed. It is then conveyed through a series of boilers, the last of which is called the *teache*. When it has acquired a proper tenacity and granular aspect, it is passed into a wooden *cooler*, where it is allowed to crystallize or *grain*. The concrete sugar is then placed in casks (usually sugar hogsheads) with holes in the bottom, each of which is partially closed by the stalk of a plantain leaf. Here the sugar is allowed to drain for three or four weeks. It is then packed in hogsheads and sent to this country under the name of *muscovado* or *raw sugar*. The uncrystallized portion is termed *molasses*; it is brought to England in casks. In Jamaica a mixture of water and molasses, with the skimmings of the clarifier and evaporating coppers, is fermented, and a vinous liquid thereby obtained, which, by distillation and rectification, yields *rum* (*spiritus sacchari*, vide pp. 196, 199, 204).

Sugar Refining.—Raw sugar contains several impurities, from which it is freed by refining. The eye recognizes the colouring matter. In an aqueous solution of raw sugar, lime is detected by oxalic acid, which throws down the white oxalate of lime; tannic acid by the dark colour produced on the addition of sesquichloride of iron, and by the precipitate formed by gelatin; glutinous and gummy matter by diacetate of lead; and free acid by litmus. By keeping, *strong* raw sugar becomes *weak*, that is, soft, clammy and gummy. This change Mr. Daniell (*Quart. Journ. of Science*, vi. 38) ascribes to the action of the lime.

The following is an outline of the refining method which I saw practised at a large sugar-house in town:—Raw sugar is dissolved in water by the aid of steam (this process is called a *blow-up*). The liquid is then heated with bullock's blood (technically called *spice*), and sometimes with hydrate of alumina (termed *finings*), and filtered through canvas. The clear liquor is allowed to percolate slowly through a bed

Fig. 89.



View of Two Vacuum-Pans and their subsidiary Apparatus.

a, a, Charging measures, supplied by pipes, which descend from *c, c,* the liquor cisterns. *d, d,* are the vacuum spheroidal pans, the lower half of each being supplied with a jacket, as a case for the steam. At the sides of the neck of each pan are a barometer and thermometer. Below the neck, and just above the horizontal line *b, b,* is the handle of the proof-stick, which appears like a stop-cock. When the syrup is sufficiently concentrated, it is discharged into the *heater, e, e.*

of coarse-grained animal charcoal nearly three feet deep, placed on a woollen cloth, supported on a false bottom of basket-work, and contained in a large wooden vessel. The filtered liquor, which is nearly colourless, is conveyed to a copper vessel (Howard's *vacuum-pan*), where it is boiled by the aid of steam, under diminished atmospheric pressure. The consistence of the liquid is examined from time to time by taking out a sample by the *proof-stick*, which is so constructed as not to admit air.

When the requisite degree of concentration has been attained, a valve is opened in the bottom of the vacuum pan, and the syrup allowed to escape into a copper vessel (*heater*), enveloped by a jacket, so as to enable it to be heated by steam. The syrup is then transferred to conical moulds (made of earthenware or iron), whose orifices are closed by a paper plug, and the next morning, when solidified, these moulds are carried to the *curing-floor*, when the stoppers are withdrawn, and the moulds placed in pots, in order to allow the *green syrups* to drain off: these are made into an inferior sort of refined sugar (*brown lumps*). The loaves are then either *clayed* or *sugared*. *Claying* consists in pouring clay and water on the base of the sugar-loaf: the water slowly percolating through the sugar, a portion of which it dissolves, carries with it the colouring matter and other impurities. *Sugaring* is effected by substituting a saturated solution of pure sugar (called *liquor*) for the clay and water: it dissolves the colouring matter but not the pure sugar. The loaves are afterwards dried in a stove, and put in blue paper for sale. (For further details, consult a paper by Messrs. Guynne and Young, *Brit. Ann. of Med.* June 23, and July 14, 1837. Also Dr. Ure's *Dict. of Arts*, art. Sugar).

The following may be regarded as an approximation to the produce of 112 lbs. of raw sugar by the above process:—

Refined Sugar	79lbs.	
Bastard	17	
Treacle	16	(12lbs. solid matter)
Water	4	
Raw Sugar	112	

Properties.—Common sugar, when pure, is white and odourless. It is the sweetest of all kinds of sugar. By the slow evaporation of its aqueous solution, it crystallizes: in this state it is called *white sugar candy* (*saccharum candum album*). The crystals are colourless; have, for their primitive form, the oblique rhombic prism; and have two axes of no double refraction. Their sp. gr. is 1·6065. Common sugar is permanent in the air, and phosphorescent in the dark on being struck or rubbed. When heated, it melts, and soon becomes coloured. By this process its tendency to crystallize is diminished or destroyed. Sugar thus altered by heat and flavoured constitutes several preparations of the confectioner; as *barley sugar* (*saccharum hordeatum*), &c. If the melted sugar be rapidly and repeatedly extended, it becomes opaque and white: in this state, it is called *penides* (*saccharum penidium*). When sufficiently heated, sugar becomes brown, evolves a remarkable odour, loses its sweet taste, and acquires bitterness: in this state, it is called *burnt sugar* or *caramel* (*saccharum tostum*). Caramel enjoys acid properties, and is composed of $C^{24}\ H^{18}\ O^{18}$ (*Peligot, Ann. Chim.* 67, p. 175). Common sugar is very soluble in water: a saturated solution of it is called *syrup:* it is thick, adhesive, and, by drying on paper, forms a kind of varnish. A watery solution of sugar, aided by heat, decomposes some of the metallic salts (as those of copper, mercury, gold, and silver); but several of them (as the diacetate of copper and nitrate of silver) require nearly a boiling temperature to change them. Sugar promotes the solubility of lime in water, and forms both a soluble and an insoluble compound with oxide of lead. Sugar is soluble in alcohol, but not so in ether. A dilute watery solution of common sugar, with a little yeast, undergoes the vinous fermentation.

Purified or *refined sugar* (*saccharum*, Ph. L.; *saccharum purificatum*, Ph. Ed.; *succus concretus purificatus*, Ph. D.) is met with in the shops in conical loaves or lumps (*loaf* or *lump sugar*) of various degrees of purity. The finest (*saccharum albissimum*) is perfectly white, and is termed *double refined;* the inferior kind (*saccharum album*) has a slightly yellowish tint, and is called *single refined.* Both varieties are compact, porous, friable, and made up of small crystalline grains.

Brown sugar (*saccharum fuscum; saccharum non purificatum*, Ph. Ed.; *succus concretus non purificatus*, Ph. D.) occurs in commerce in the form of a coarse powder composed of shining crystalline grains. It is more or less damp and sticky, and has a peculiar smell and a very sweet taste. Its colour is brownish yellow, but varying considerably in intensity. *Muscovado* or *raw sugar* has the deepest colour and is intermixed with lumps. *Bastard* is a finer kind, prepared from molasses and the green syrups. The *Demerara crystal sugar* is the finest: its colour is pale yellow, and its crystals are larger and more brilliant than the preceding varieties.

Treacle (*fæx sacchari*, Ph. L.; *syrupus empyreumaticus*, Ph. Ed.; *syrupus empyreumaticus, anglicè molasses*, Ph. D.) is the viscid, dark brown, uncrystallizable syrup which drains from the sugar-refining moulds. It is thicker than West Indian molasses, and has a different flavour. Its sp. gr. is generally 1·4; and it contains, according to Dr. Ure, on an average, 75 per cent. of solid matter.

Chemical Characteristics.—Sugar is known by its sweet taste, its solubility in hot and cold water and in alcohol, its being decomposed, with the evolution of charcoal, by sulphuric acid, its conversion into oxalic and other acids by nitric acid, its fusing, charring, emitting a remarkable odour (called the odour of caramel), and inflaming by heat, and, lastly, by its not causing, when pure, any precipitate with acetate or diacetate of lead. Susceptibility of vinous fermentation and crystallizability are properties not common to all varieties of sugars, as the following table shews:—

1. Sugars susceptible of vinous fermentation.
   - (*a*) *Crystallizable.* This division includes *common sugars* (viz. *cane, maple*, and *beet-root sugars*) and *granular sugars* (viz. *grape, honey, starch*, and *diabetic sugars*).
   - (*b*) *Uncrystallizable.* Called *liquid* or *mucous sugars*, as that in treacle.
2. Sugars unsusceptible of vinous fermentation.
   - (*a*) *Crystallizable.* Here belong *milk sugar* and *mannite* (this includes mushroom sugar).
   - (*b*) *Uncrystallizable.* Under this head are placed *glycyrrhizin, sarcocollin*, and *glycerin.*

Composition.—The following is the ultimate composition of sugar:—

	Eq.		Eq. Wt.		Per cent.
Carbon	12	...	72	...	44·44
Hydrogen	10	...	10	...	6·18
Oxygen	10	...	80	...	49·38
Anhydrous Sugar	1	...	162	...	100·00

	Eq.		Eq. Wt.		Per cent.
Anhydrous Sugar	1	...	162	...	94·74
Water	1	...	9	...	5·26
Crystallized Sugar	1	...	171	...	100·00

Peligot (*Ann. Chim.* 67, 124) says, anhydrous sugar is composed of C^{12} H^9 O^9.

Dr. Prout (*Phil. Trans.* 1827, p. 355) regards sugar as a secondary compound of *carbon* and *water*. Dobereiner (Gmelin, *Handb. d. Chem.* 2, 735), on the other hand, views crystallized sugar as a *carbonate of hydrocarbon*. Dr. Prout found that while, in the different varieties of sugar, the ratios of carbon to the elements of water varied, yet, that the relative quantity of hydrogen to oxygen was always in the proportion to form water.

PHYSIOLOGICAL EFFECTS. (*a.*) *On vegetables.*—Sugar appears to contribute directly to the nutrition of plants: the saccharine juices of the sugar cane, of the maple, of the beet-root, &c. must be regarded as nutritive. Yet, it is somewhat remarkable, and apparently inconsistent with this statement, that saccharine matter is found in the excretions of plants, as those formed by the nectariferous glands. Sugar appears to be especially adapted for the food of young plants, hence we find it generated in many seeds (as peas, barley, &c.) during germination.

(*b.*) *On animals.*—It is nutritive to some animals. Thus it is an important constituent of milk, a liquid intended for the nourishment of mammals during the first period of their existence. Many insects (especially the *Lepidoptera*, *Hymenoptera*, and *Diptera*) feed on sugar or saccharine liquids. Its asserted poisonous action on some *Annelida*, birds, and frogs (vide Murray, *App. Med.* v. 411) requires confirmation. That a diet of sugar only is incapable of supporting the life of mammals and birds has been fully proved by the experiments of Magendie (*Ann. de Chim.* iii. 66, 1816) and Tiedemann and Gmelin (Müller's *Elem. of Phys.* by Baly, p. 482). Dogs and geese die when confined and fed solely on sugar and water, with all the symptoms of starvation. Change or alteration of diet, with the use of a certain portion of nitrogenous food, seems essential to the vitality of these animals.

(*c.*) *On man.*—Sugar is employed by man principally on account of its agreeable taste, rather than as a direct source of nourishment; yet, of its nutritive qualities few entertain any doubt. During the sugar season of the West India Islands, "every negro on the plantations, and every animal, even the dogs, grow fat" (Wright, *Med. Plants of Jamaica*). The injurious effects which have been ascribed to sugar are more imaginary than real. Some individuals have consumed large quantities of it for a long series of years without suffering any ill consequences (Slare, *Vindication of Sugars*, 1715). Stark's experiments (Stark's *Work*, ed. by J. C. Smith, pp. 100 and 115, 1788) hardly admit of any legitimate conclusions being drawn therefrom, as to the action of sugar. The fondness of children for sugar may be regarded as a natural instinct, since nature, by placing it in milk, evidently intended sugar to form a part of their nourishment during the first period of their existence. The popular notion of its having a tendency to injure the teeth seems most absurd, as Dr. Slare (*op. cit.*) has shewn. "It has been alleged that the eating of sugar spoils the colour of and corrupts the teeth; this, however, proves to be a mistake, for no people on the earth have finer teeth than the Negroes in Jamaica" (Wright, *op. cit.*). It is a generally-received opinion that sugar has a tendency to cause flatulency and preternatural acidity of the *primæ viæ*. Occasionally, perhaps, it may do so, but I have never observed it. Though a dyspeptic myself, and obliged to be careful as to diet, I have never experienced any injurious effects from the use of sugar, of which I am remarkably fond. In a medicinal point of view, sugar is to be regarded demulcent and emollient.

Uses.—The principal use of sugar, considered *dietetically*, is for sweetening various articles of food, whose nutritive qualities also it promotes. In diabetes, sugar and sweet foods should be carefully excluded. In dyspepsia, its effects are to be carefully examined, and if found to be injurious, its use ought to be prohibited. In some disordered conditions of the renal secretion, sugar is advantageous; in others injurious. The copious use of unrefined sugar is likely to prove injurious in some nephritic disorders, on account of the lime contained in it.

Medicinally, sugar is but little employed. In the form of lozenges, sugar candy, &c., it is slowly dissolved in the mouth to allay tickling cough. As a chemical antidote, it has been recommended in poisoning by the salts of copper, mercury, silver, gold, and lead (Vogel & Buchner, in *Schweigger's Journ.* xiii. 162; xiv. 224). But any advantage procured by its use, in these cases, is referrible to its demulcent and emollient properties, and not to its chemical influence. The same remark may be made with respect to the benefit said to have been obtained by the use of the juice of the sugar-cane in poisoning by arsenious acid (Chisholm, *Quart. Journ. of Science*, x. 193). Powdered white sugar is sometimes sprinkled over ulcers, to remove spongy granulations, denominated proud flesh. The same remedy has also been employed for the removal of specks on the cornea.

In *pharmacy* the uses of sugar are much more extensive. It serves to preserve, to give flavour, bulk, form, colour, cohesiveness, and consistence; to sub-divide and to suspend oily substances in aqueous liquids. To fulfil one or more of these objects, it is a constituent of *syrups*, *elæosacchara* (p. 77), *conserves*, *electuaries*, *confections*, *lozenges*, some *pills* and *powders*, &c.

Syrupus.—Ph. Lond. *Syrupus simplex;* Ph. Ed. & Dub. *Syrup*, *Simple syrup.* Sugar [refined E. D.] ℔ x. [15 parts E., ℥xxix. D.]; water, Oiij. [8 parts E., Oj. D.] Dissolve the sugar in the water by a gentle heat, *Ph. L.* It is used to give flavour, cohesiveness, and consistence.

Liquor Sacchari tosti. Caramel.—This is a useful innocuous colouring agent. It is prepared by melting half a pound of brown sugar in an iron pot, and applying heat until the sugar blackens, and becomes bitter: then add a gallon of boiling water.

Hor'deum dis'tichon, Linn., L. E. D.—*Common* or *Long-eared Barley.*

Sex. Syst. Triandria, Digynia.

(Semina integumentis nudata, *Ph. L.*; Semina decorticata, *E. D.*)

History.—Pliny (*Hist. Nat.* xviii. 14), on the authority of Menander, says, barley was a most ancient aliment of mankind. It was cultivated in Egypt nearly 1500 years before Christ (*Exodus* ix. 31). Hippocrates mentions three kinds of barley; they were, probably, *H. vulgare*, *H. distichum*, and *H. hexastichum*.

BOTANY. *Gen. Char.*—*Spikelets* three together, the lateral ones usually withered, two flowered, with an upper flower reduced to a subulate rudiment. *Glumes* two, lanceolate-linear, with subulate awns, flattish, unequal sided, at right angles [*contrariæ*] with the paleæ almost unilateral, turned inwards [*anticæ*], herbaceous, rigid. *Paleæ* two, herbaceous; the inferior one (turned inwards), concave, ending in an awn; the superior one (turned outward) contiguous to the rachis, bicarinate. *Stamina* three. *Ovarium* hairy at the apex. *Stigmata* two, sessile, somewhat terminal, feathery. *Scales* two, entire or augmented by a lateral lobe, usually hairy or ciliated. *Caryopsis* hairy at the point, oblong, with a longitudinal furrow internally, adherent to the paleæ, rarely free (*Kunth*).

Sp. Char.—The lateral *florets* male, awnless: the hermaphrodite ones distichous, close-pressed to the stem, awned (*Kunth*).

Hab.—A native of Tartary, cultivated in this country along with three other species; viz. *H. vulgare* (*spring barley*), *H. hexastichon* (*winter barley*), and *H. Zeocitron* (*sprat* or *battledore*).

FIG. 90.

a. H. vulgare.
b. H. hexastichon.
c. H. distichon.
d. H. Zeocitron.

DESCRIPTION.—The grains (*semina hordei cruda*) are too well known to need description. Deprived of their husk by a mill, they form *Scotch, hulled*, or *pot barley* (*hordeum mundatum*). When all the integuments of the grains are removed, and the seeds are rounded and polished, they constitute *pearl barley* (*hordeum perlatum*; *semina* [*hordei*] *integumentis nudata*, L.; *semina decorticata*, E. D.) The farina obtained by grinding pearl barley to powder is called *patent barley*.

COMPOSITION.—According to Einhof (Gmelin's *Handb.* ii. 1344), 100 parts of ripe barley corns consist of *husk* 18·75, *meal* 70·05, *water* 11·20. The same chemist obtained from 100 parts of barley meal, *fibrous matter* (composed of gluten, starch, and woody fibre) 7·29, *starch* 67·18, *gum* 4·62, *uncrystallizable sugar* 5·21, *gluten* 3·52, *albumen* 1·15, *superphosphate of lime with albumen* 0·24, *water* 9·37, *loss* 1·42. Fourcroy and Vauquelin detected an odorous acrid *oil*, to which the odour of spirit from raw grain is to be ascribed: it resides in the integuments of the grains. The *hordein* of Proust is said, by Raspail (*Chim. Org.* ii. 112), to be nothing but bran more minutely divided than that which remains in the sieve. The grains of barley starch have the same form and appearance as those of wheaten starch: they do not exceed ·00098 of an inch in size.

Chemical Characteristics.—Iodine forms the blue iodide of starch when added to the cold decoction of barley. Decoction of whole barley has an acrid bitter taste, which it derives from the husk.

Physiological Effects.—The husk of barley is slightly acrid and laxative. Deprived of this (as in Scotch and pearl barley) the seeds are highly nutritious. Barley bread (*panis hordeaceus*) is said to be more difficult of digestion than wheaten bread. The aqueous decoction of Scotch or pearl barley is emollient, demulcent, and easy of digestion. When used in soup, Count Rumford regards barley-meal as being three or four times as nutritious as wheat-flour.

Uses.—Barley water is employed as a demulcent and emollient drink in febrile disorders, pulmonic inflammation, and irritation of the alimentary canal, whether produced by acrid poisons or other causes.

Administration.—Scotch and pearl barley are used in medicine. Count Rumford (*Essay on Feeding the Poor*, p. 291, 1800) says, the entire grains of barley may be used in broths with equal advantage.

1. *Decoctum Hordei*, Ph. L. *Aqua hordeata*; *barley water.*—Barley [pearl barley], ℥iiss; water, Oivss. First wash away, with water, the foreign matters adhering to the barley seeds; then, half a pint of the water being poured on them, boil the seeds a little while. This water being thrown away, pour the remainder of the water, first made hot, on them, and boil down to two pints, and strain, *Ph. L.* The processes of the *Edinburgh* and *Dublin* Pharmacopœias are not essentially different.

This is a valuable drink for the invalid in febrile cases and inflammatory disorders, especially of the chest, bowels, and urinary organs. It is usually flavoured with sugar, and frequently with some slices of lemon. It is a constituent of the *Enema Aloes*, L., *Enema Terebinthinæ*, L., and *Decoctum Hordei compositum*, L.

2. *Decoctum Hordei compositum*, Ph. L. & D.—Decoction of barley, Oij. [Oiv.]; figs sliced, ℥iiss. [℥ij.]; liquorice [root] sliced and bruised, ʒv. [℥ss.]; raisins [stoned], ℥iiss. water, Oj. Boil down to two pints and strain (*Lond.*) The quantities, &c. within brackets are those directed by the Dublin College: no water is ordered by the latter. This decoction is emollient, demulcent, and slightly aperient. It is employed in the same cases as the simple decoction.

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1. Maltum. *Malt.*—This is barley made to germinate by moisture and warmth, and afterwards dried, by which the vitality of the seed is destroyed. When scorched it is called *high-dried malt*. During the process the quantity of sugar in the seed is increased. *Wort* (*decoctum* seu *infusum malti*) is nutritious, and has been used as an antiscorbutic and tonic. Macbride (*Hist. Account of a new Method of Treat. Scurvy*, 1767) recommended it in scurvy; but it is apt to increase the diarrhœa. As a tonic it has been used in scrofulous affections, purulent discharges, as from the kidneys, lungs, &c. and in pulmonary consumption (Rush, *Med. Observ. & Inq.* iv. 367). The decoction is prepared by boiling three ounces of malt in a quart of water. This quantity may be taken daily.

2. Cerevisia. *Malt liquor; beer and ale.*—A fermented decoction of malt and hops. It is a refreshing and nutritive beverage. Taken to excess it is intoxicating. It should be avoided, or at least used with great caution by the dyspeptic, by those disposed to lithic acid deposits, by plethoric persons having a tendency to apoplexy, &c. For medicinal purposes *bottled porter* or *stout* (*cerevisia lagenaria*) is in general to be preferred. It is used as a restorative in the latter stage of fever, and to support the powers of the system after surgical operations, severe accidents, &c.

3. Cerevisiæ Fermentum, Ph. L. D. *Yeast*, *barm*, or *zumin.* Yeast separates

from *must* (*mustum*) and *wort* during fermentation, partly as a scum, partly as a sediment. Examined by a miscroscope it is found to be composed of minute vesicles, containing globules. MM. Cagniard Latour, and Turpin (*Biblioth. Univ. de Genève*, Nov. 1838) regard these vesicles as seeds (*spores?*), to whose germination the phenomena of fermentation are owing; for when they are placed in a saccharine fluid they germinate and produce little plants, which Turpin has denominated *Torula Cerevisiæ* (Nat. Ord. *Fungi*, Subd. *Mucedines*). The growth takes place at the expense of the sugar, which is partly converted into alcohol, while the plant gives out carbonic acid. Turpin detected these vesicles also in the cellular tissue under the envelope of the grain of barley. The remarkable and peculiar property possessed by yeast of exciting the vinous fermentation depends, according to the above authorities, on the vital properties of the microscopic vegetables of which it is composed. When boiled in water its vitality is destroyed, and in consequence it no longer retains the power of exciting fermentation. Considered in a chemical point of view, yeast possesses many of the properties of gluten.

Yeast has been administered internally as a tonic and antiseptic in typhoid fevers. Dr. Stoker (*On Continued Fever*, p. 121, Dubl. 1829-30) states, that it usually acts as a mild laxative, improves the condition of the alvine evacuations, and is more effectual in removing petechiæ and black tongue than any other remedy. It is admissible where cinchona and wine cannot be employed, on account of the inflammatory symptoms. The dose of it is two table-spoonfuls every third hour, with an equal quantity of camphor mixture. Enemata of yeast and asafœtida are said, by the same writer, to be efficacious against typhoid tympany.

Externally yeast is employed in the form of poultice. The *Cataplasma Fermenti*, L. & D. is prepared by mixing one pound of wheaten flour with half a pint of yeast. Expose the mixture to a gentle heat until it begins to rise. It is applied to fœtid and sloughing sores as an antiseptic and stimulant: it destroys the fetor, often checks the sloughing, and assists the separation of the dead part. I have frequently heard patients complain of the great pain it causes. The carbonic acid is supposed to be the active ingredient.

A poultice composed of the *grounds of stale beer*, and equal parts of oatmeal and linseed meal, is sometimes substituted for the yeast poultice. Its effects are analogous to the latter.

Ave'na sati'va, Linn. L. E. D.—*The Common Oat.*

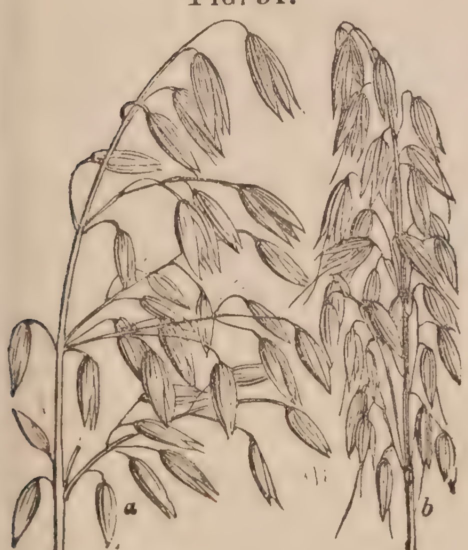
Sex. Syst. Triandria, Digynia.

(Semina integumentis nudata, *L.* Semina Avenæ sativæ: Semina decorticata; Farina Avenæ sativæ ex seminibus, *E.* Farina ex seminibus, *D.*)

History.—The oat is not mentioned in the Old Testament. Theophrastus, Dioscorides, and Pliny, speak of it.

Botany. *Gen. Char.*—*Spikelets* three, many flowered; flowers remote; the upper one withered. *Glumes* two, thin, membranous, awnless. *Paleæ* two, herbaceous; the lower one awned on the back, above the base, at the point almost bicuspidate; the upper one bicarinate, awnless; awn twisted. *Stamina* three. *Ovarium* somewhat pyriform, hairy at the point. *Stigmata* two, sessile, distant, villoso-plumose; with simple hairs. *Scales* two, smooth, usually two-cleft, large. *Caryopsis* long, slightly terete, internally marked by a longitudinal furrow, hairy at the point, covered by the paleæ, adherent to the upper one (?) (*Kunth*).

Fig. 91.



Avena sativa.

a. The *white oat.* *b.* The *Siberian* or *Tartarian oat.*

Sp. Char.—*Panicle* equal. *Spikelets* two-flowered. *Florets* smaller than the calyx, naked at the base, alternately awned. *Root* fibrous, annual (*Kunth*).

Hab.—Cultivated in Europe.

Several varieties are cultivated in this country; viz. the *white oat*, the *black oat*, the *red oat*, the *Poland oat*, the *Friezland* or *Dutch oat*, the *potatoe oat*, the *Georgian oat*, and the *Siberian* or *Tartarian oat* (Loudon's *Encycl. of Agricult.*)

Description.—Oats (*semina avenæ cruda*) are too well known to need description. When deprived of their integuments, they are called *groats* (*semina integumentis nudata*, L.; *semina decorticata*, E. *avena excorticata* seu *grutum*): these when crushed, are denominated *Embden groats*. *Oatmeal* (*avenæ sativæ farina ex seminibus*, E.; *farina ex seminibus* D.) is prepared by grinding the grains. It is not so white as wheaten flour, and has a somewhat bitterish taste.

Composition.—The grains consist, according to Vogel, of *meal* 66, and *bran* 34. The dried meal is composed of *fixed oil* 2·0, *bitter matter* and *sugar* 8·25, *gum* 2·5, *grey albuminous matter* 4·3, *starch* 59, *husk* and loss 23·95,

Chemical Characteristics.—Iodine forms the blue iodide of starch with the cold decoction of oats.

Physiological Effects.—Oatmeal is nutritive, though less so than wheaten flour. "It is especially the food of the people of Scotland, and was formerly that of the northern parts of England; countries which have always produced as healthy and as vigorous a race of men as any other in Europe" (Cullen, *Mat. Med.* i. 278). Unfermented oat-bread (*panis avenacea*), in those unaccustomed to it, is apt to occasion dyspepsia with heartburn, and was formerly thought to have a tendency to cause skin diseases, but without just grounds. Considered medicinally, groats and oatmeal are nutritious, easily digestible, and yield an excellent diet for the invalid.

Uses.—In medicine we employ *gruel* prepared from groats or oatmeal as a mild, nutritious, and easily digested article of food in fevers and inflammatory affections. In poisoning by acrid substances, it is employed as an emollient and demulcent. It is given after the use of purgatives, to render them more efficient and less injurious. Poultices are sometimes made with oatmeal.

Decoctum Avenæ; *Water Gruel.*—This is prepared by boiling an ounce of oatmeal with three quarts of water to a quart, constantly stirring; strain, and, when cold, decant the clear liquid from the sediment. Sugar, acids, or aromatics, may be employed for flavouring (Cullen, *op. cit.*)

Pulvis pro Cataplasmate, D.—Linseed, which remains after the expression of the oil, one part; oatmeal, two parts. Mix. This is an unnecessary formula. Moreover, it is a bad one; for linseed-meal should be prepared from unpressed flax seed. The *Cataplasma simplex*, D. is prepared by mixing this powder with as much boiling water as will form a cataplasm, which should be smeared over with olive oil. It is used as an emollient application to allay pain and promote suppuration.

Trit'icum vulga're, var. β, *hybernum*, Kunth, (T. hybernum, L. E. D.)—*Common Wheat.*

Sex Syst. Triandria, Digynia.

(Farina; farina seminum: Amylum; seminum, fæcula, *L.*; Amylum; ex Tritico hyberno, *E.*; Farina seminum, *D.*)

History.—In the earlier ages it was an esteemed article of food Levit. ii.), and is frequently spoken of by Hippocrates (*De Diæta*). Pliny (*Hist. Nat.* xviii. 12) describes several kinds of it.

Botany. *Gen. Char.*—*Spikelets* three or many flowered; the fruciferous rachis generally articulated, flowers distichous. *Glumes* two, nearly opposite, almost equal, awnless or awned: the upper one bicarinate; the keels more or less aculeato-ciliate. *Stamina* three. *Ovarium* pyriform, hairy at the apex. *Stigmata* two, terminal, subsessile, feathery; with long, simple, finely-toothed hairs. *Scales* two, generally entire and ciliated. *Caryopsis* externally convex, internally concave, and marked by a deep furrow, distinct, or adhering to the paleæ (*Kunth*).

Sp. Char.—*Spike* four-cornered, imbricated; with a tough rachis. *Spikelets* generally four-flowered. *Glumes* ventricose, ovate, truncate, mucronate, compressed below the apex, round, and convex at the back, with a prominent nerve. *Flowers* awned or awnless. *Grains* loose. (*Kunth*).

α. *æstivum*: annual; glumes awned.
β. *hybernum*: biennial; glumes almost awnless.

Hab.—It is a native of the country of the Baschkirs, and is cultivated in Europe.

Besides the above two varieties, no less than five other kinds of Triticum have been cultivated for their grain.

Fig. 92.

Triticum.—Wheat.

a, T. vulgare, α. æstivum.
b, T. vulgare, β. hybernum.
c, T. turgidum, (compositum).
d, T. turgidum.
e, T. polonicum.
f, T. Spelta.
g, T. monococcum.

Description.—Wheat (*semina tritici*, off.) is reduced by grinding and sifting in mills into *flour* (*farina; seminum farina*, L. D.; *farina tritici*) and bran (*furfur tritici*). The same wheat yields several qualities of flour, distinguished as *firsts*, or *fine flour*; *seconds*; and *thirds*, or *middlings*.

Composition.—The following are the constituents of several kinds of wheat (Vauquelin, *Journ. Pharm.* viii. 353).

	French Wheat.	Odessa Hard Wheat.	Odessa Soft Wheat.	Ditto.	Ditto.	Flour of Paris bakers.	Ditto, of good quality, used in public establishments.	Ditto, inferior kind.
Starch....	71·49	56·5	62·00	70·84	72·00	72·8	71·2	67·78
Gluten ..	10·96	14·55	12·00	12·10	7·30	10·2	10·3	9·02
Sugar	4·72	8·48	7·56	4·90	5·42	4·2	4·8	4·80
Gum	3·32	4·90	5·80	4·60	3·30	2·8	3·6	4·60
Bran	..	2·30	1·20	..	..	..	..	2·00
Water....	10·00	12·00	10·00	8·00	12·00	10·0	8·0	12·00
	100·49	98·73	98·56	100·44	100·02	100 0	97·9	100·20

The substance commonly termed *gluten* is a compound of *vegetable albumen*, which is insoluble in alcohol, of *mucin*, soluble in hot alcohol, and of *glutin* or *gliadine*, soluble in both hot and cold alcohol.

Chemical Characteristics.—The cold decoction of wheat-flour forms, with tincture of iodine, the blue iodide of starch. If wheat-flour be made into a paste, with water, and then kneaded under a stream of water until the liquid runs off colourless, the residue in the hand is *gluten*. The water, on standing, deposits *starch*; but retains in solution *gum*, *sugar*, and some phosphatic *salts*. Nitric acid gives wheat-flour a fine orange-yellow colour. Recently-prepared tincture of guaiacum forms a blue colour with good wheat-flour.

Manufacture of Starch.—Starch is procured by steeping wheat-flour in water for one or two weeks, during which time acetous fermentation takes place. The acid liquor (*sours*) is drawn off, and the impure starch washed on a sieve, to separate the bran. What passes through is received in large vessels, termed *frames*. Here the starch is deposited. The sour liquor is again drawn off, and the *slimes* removed from the surface of the starch, which is to be again washed, strained, and allowed to deposit. When, by these processes, the starch has become sufficiently pure, it is *boxed*, that is, it is placed in wooden boxes perforated with holes and lined with canvas, where it drains. It is then cut in square lumps, placed on bricks, to absorb the moisture, and dried in a stove. While drying it splits into prismatic pieces, similar to grain tin, or columns of basalt. The greater part of the starch used for stiffening linen (called *Poland* and *glaze starch*) is coloured blue by finely-powdered smalt, or by indigo. This is not adapted for medicinal purposes. *White* (sometimes called *French*) *starch* should be employed. A fine variety of this is termed *patent white starch*.

Properties of Starch.—Pure wheat starch (*amylum*, L. D.; *amylum ex Tritico hyberno*, E.) is white, and almost odourless and tasteless. Examined by the microscope, it is found to consist of rounded or spherical grains, not exceeding the ·002 of an inch in diameter. These grains consist of a membranous coat (*amidon; amylin; tegument of the fecula*) enclosing transparent colourless substance (*gummy matter; amidin*). When immersed in cold water, they swell up, but remain entire; in boiling water, they burst, the gummy matter is dissolved, while the integument swells up, becomes transparent, and floats. Boiled in water, starch yields a *mucilage*, which, if sufficiently concentrated, forms a *jelly* (*hydrate of starch*) on cooling. With iodine, a cold decoction of wheat starch forms the iodide of starch, the blue colour of which is removed by alkalies or heat.

The starch of some plants (*e. g.* the potatoe) is composed of concentric layers (Fritzsche, *Poggendorf's Ann. d. Phys.* Bd. xxxii. S. 129; also Payen, quoted by Lindley, in his *Introd. to Botany*, 3d ed. p. 557).

Composition of Starch.—Starch has the following composition:—

	Eq.	Eq. Wt.	Per cent.	F. Marcet.	Prout.
Carbon	7	42	43·75	43·7	42·80
Hydrogen	6	6	6·25	6·7	6·35
Oxygen	6	48	50·00	49·7	50·85
Starch	1	96	100·00	100·1	100·00

Physiological Effects.—Wheat surpasses all other cereal grains in its nutritive qualities, in consequence of containing more gluten. It yields the finest, whitest, and most digestible kind of bread. Flour is employed in medicine to form emollient and demulcent preparations.

Wheat-starch, though highly nutritious, is not employed alone as an article of food. Its taste is somewhat disagreeable, and it is more difficult of digestion than other starchy substances.

Uses.—Wheat-flour is rarely used in medicine. It is occasionally sprinkled over burnt or scalded parts, and is a constituent of some poultices, as *Cataplasma fermenti*, Ph. L. Mixed with water, so as to form a thin mucilage, it may be employed as a chemical antidote in some cases of poisoning, as by the bichloride of mercury, sulphate of copper, iodine, &c. It is used in pharmacy for enveloping pills.

Starch powder is used as a dusting powder to absorb acrid secretions and prevent excoriations. It is used as an emollient and demulcent clyster in inflammatory conditions of the large intestines, and as a vehicle for the formation of other more active enemata. It is an antidote for poisoning by iodine, and is sometimes given in combination with this substance to prevent its local action (vide p. 121). It enters into the composition of the *Pulvis Tragacanthæ compositus*, Ph. L.

Decoctum Amyli, L. Mucilago Amyli, E. D.—*Decoction*, or *mucilage of starch.* "Take of starch, ʒiv. (ʒiij. E.; ʒvj. D.); water, Oj. Rub the starch with the water gradually added, then boil for a short time." It is sometimes used alone, as an enema in dysentery, irritation of the rectum, &c. It is a constituent of the *Enema Opii*, L.

1. Panis Triticeus. *Wheaten Bread.—Crumb of bread* (*mica panis*) is sometimes used in the formation of pills; but is objectionable for this purpose, on account of the pills thus made becoming excessively hard by keeping. Furthermore, in some cases, the constituents of bread decompose the active ingredients of the pills. Thus the chloride of sodium of bread decomposes and renders inert nitrate of silver. Crumb of bread is most valuable for the preparation of poultices. *The bread and water poultice* is prepared by covering some crumb of bread in a basin with hot water: after it has stood for ten minutes, pour off the excess of water, and spread the bread about one-third of an inch thick on soft linen, and apply to the affected part. Sometimes lint dipped in oil is applied beneath the poultice (Abernethy, *Lancet*, v. 5, 1824, p. 135). Decoction of poppy, or Goulard's water, may be substituted for common water. This is a valuable application to phlegmonous inflammation. *A bread and milk poultice*, to which lard is sometimes added, is also used to promote suppuration; but it should be frequently renewed,

on account of its tendency to decompose. Both poultices are used in the treatment of irritable ulcers. *Toasted bread* (*panis tostus*) is used in the preparation of *toast-water* (*infusum panis tosti*), a mild, agreeable drink in febrile disorders, and in some dyspeptic cases. *Brown* or *bran bread* (*panis furfuraceus*) is used by persons troubled with habitual costiveness: it acts as a slight laxative. It sometimes causes flatulency and acidity. *Biscuit* (*panis biscoctus*) is used by some dyspeptics as a substitute for fermented bread. *Sea biscuit* (*panis nauticus*) is preferred by some.

2. Furfur Tritici. *Bran.*—Decoction or infusion of bran is sometimes employed as an emollient foot-bath. It is also taken internally as a demulcent in catarrhal affections. Its continued use causes a relaxed condition of bowels.

Seca'le cerea'le. Linn.—*Common Rye.*

Sex. Syst. Triandria, Digynia.

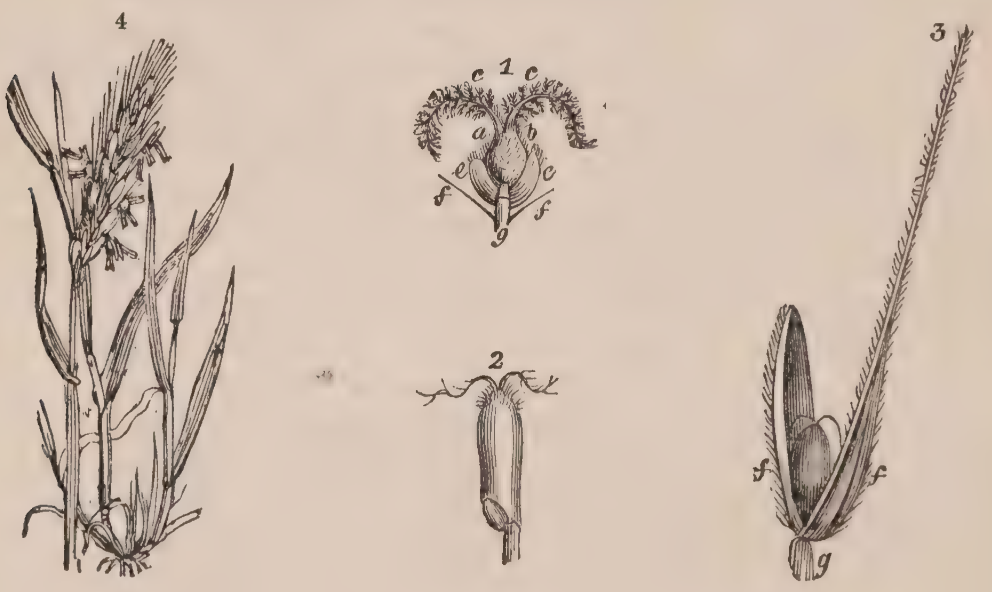
(Semina *Offic*).

History.—Rye is mentioned in the Old Testament.

Botany. *Gen. Char.*—*Spikelets* two-flowered. *Florets* sessile, distichous, with the linear rudiment of a third terminal one. *Glumes* two, herbaceous, keeled, nearly opposite, awnless or awned. *Paleæ* two, herbaceous; the lower one awned at the point, keeled, unequal sided, broadest and thickest on the outer side; the upper shorter and bicarinate. *Stamina* three. *Ovarium* pyriform, hairy. *Stigmata* two, nearly sessile, terminal, feathery, with long, simple, finely-toothed hairs. *Scales* two, entire, ciliate. *Caryopsis* hairy at the point, loose (*Kunth*).

Sp. Char.—*Glumes* and *awns* scabrous (*Kunth*).

Fig. 93.



Secale cereale.

1. *a*, ovarium, with its hairs, *b*; *c*, *c*, the plumose stigmata; *e*, *e*, scales; *f*,*f*, position of paleæ; *g*, receptacle.
2. mature grain, with the embryo at the base and the remains of the stigmata at the top.
3. *f*, *f*, paleæ; *g*, receptacle.
4. entire plant.

Hab.—The Caucasian-Caspian desert. Cultivated in Europe.

Composition.—The grains consist, according to Einhof, of *meal*, 65·6; *husk*, 24·2; and *moisture*, 10·2. The meal is composed of *uncrystallizable sugar*, 3·28; *gum*, 11·09; *starch*, 61·07; *husky matter* (woody fibre), 6·38; *gluten*, soluble in alcohol, 9·48; *albumen*, 3·28; *undetermined acid* and loss, 5·62 (Gmelin, *Handb.* 2, 1343).

Chemical Characteristics.—A cold decoction of rye forms with iodine the blue iodide of starch.

Physiological Effects.—Rye-flour is nutritive, but less so than wheat-flour. In those unaccustomed to it, rye-bread (*panis secalinus*) is said to be apt to occasion diarrhœa: this is ascribed to its readily becoming acescent (Cullen, *Mat. Med.* i. 277).

Use.—Rye-bread is in common use among the inhabitants of the northern parts of Europe, but in this country is rarely employed. Rye-pottage (*pulmentum* vel *jusculum secalinum*) is said to be a useful article of diet in consumptive cases (Pearson, *Pract. Synop. of the Mat. Alim.* 91).

Seca'le cornu'tum.—Spurred Rye or Ergot.

(Ergota, *Ph. Lond.*)

History.—No undoubted reference to ergot is found in the writings of the ancients. The disease produced by it is supposed to be referred to in the following passage:—" 1089. A pestilent year, especially in the western parts of Lorraine, where many persons became putrid, in consequence of their inward parts being consumed by St. Anthony's fire. Their limbs were rotten, and became black like coal. They either perished miserably; or, deprived of their putrid hands and feet, were reserved for a more miserable life. Moreover, many cripples were afflicted with contraction of the sinews [*nervorum contractio*].—(Extract from the works of Sigebert, in the *Recueil des Histor. des Gauls et de la France*, tom. xiii. p. 259*).

The first botanical writer who notices ergot is Lonicerus (*Kreuterbuch*, p. 285, Franckfort, 1582). It seems to have been employed by women to promote labour pains long before its powers were known to the profession. Camerarius, in 1683 (Dierbach, *Neuest. Entd. in d. Mat. Med.* 130, 1837), mentions that it was a popular remedy in Germany for accelerating parturition. In Italy and France also it appears to have been long in use (Bayle, *Bibl. Thérap.* iii. 375).

Botany.—The nature and formation of ergot are subjects on which botanists have been much divided in opinion.

1. *Some regard ergot as a fungus growing between the glumes of grasses in the place of the ovary.* Otto von Münchausen (*Hausvater*, i. 332, 1764-1773); Schrank (*Baiersche Flora*, ii. 571, 1789); Decandolle (*Mém. du Mus. d'Hist. Nat.* ii. 401, 1815); Fries (*Syst. Mycol.* ii. 268, 1822); Wiggers (*Inq. in Secale Corn.* &c. Götting. 1831, in Christison's *Treatise*), and Berkeley (*English Flora*, vi. Part ii. 226, 1836), have adopted this opinion, and have described ergot as a fungus under the name of *Spermoedia Clavus*†, Fr. (*Clavaria Clavus*, Münch.; *Sclerotium Clavus*, Dec.) Fries and Berkeley, however, evidently entertain some doubts respecting its nature; for the first adds to the generic character of Spermoedia " *Semina graminum morbosa*," and the second says, " it appears to be only a diseased state of the grain, and has scarcely a sufficient claim to be admitted among fungi as a distinct genus."

Against this opinion may be urged the circumstance noticed by Tessier (quoted by Decandolle), that a part only of the grain may be ergotized. Moreover, the scales of

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* A passage somewhat similar to the above, with the addition of the following, " the bread which was eaten at this period was remarkable for its deep violet colour," is quoted by Bayle (*Biblioth. Thérap.* tom. iii. p. 374), from *Mézerai, Abrégé Chronologique*. But I cannot find the passage in the first and best edition of Mezeray's *Abrégé Chron.* 3 vols. 4to. 1668; or in his *Histoire de France*; or in his *Mémoires Hist. et Critiques*. Whether or no it be in the second and less perfect edition of Mezeray's *Abrégé Chronologique*, I am unable to decide, not having seen this work.

† Erroneously quoted in the *Pharm. Lond.* 1836, as *Acinula Clavus*.

the base of the ergot, the frequent remains of the stigma on its top, and the articulation of it to the receptacle, prove that it is not an independent fungus, but an altered grain (Quekett, in *Proceedings of the Linn. Soc.* Dec. 4, 1838).

2. *Some regard ergot as a diseased condition of the ovary or seed.* The arguments adduced against the last opinion are in favour of the present one. Though a considerable number of writers have taken this view of the nature of ergot, there has been great discordance among them as to the causes which produced the disease.

α. *Some have supposed that ordinary morbific causes, as moisture combined with warmth, were sufficient to give rise to this diseased condition of the grain.* Tessier (*Mém. Soc. Roy. Médec.* 1776, p. 417; 1777, p. 587), and Willdenow (in Christison's *Treatise*, p. 829) appear to have been of this opinion.

β. *Some have ascribed the disease to the attack of insects or other animals.* Tillet, Fontana, Réad, and Field, (referred to by Christison, *op. cit.* p. 830) supported this view, which, I may add, has subsequently been satisfactorily disproved.

γ. *Some, dissatisfied with the previously assigned causes of the disease, have been content with declaring ergot to be a disease, but without specifying the circumstances which induce it.* Mr. Bauer (MS. *British Museum*), who closely watched the developement of ergot during five years (1805-13), and has made some beautiful drawings of it in different stages, arrived at this conclusion; as also Phœbus (*Deutschl. kryptogam. Giftegewächse*, Berlin, 1838).

δ. *Others have referred the disease to a parasitic fungus.* This opinion, which must not be confounded with that entertained by Decandolle and others (vide *supra*), has been adopted and supported by Léveillé, in 1826 (*Ann. de la Soc. Linn. de Paris*), by Smith (*Proceedings of the Linn. Soc. of Lond.* Nov. 1838), and by Quekett (*ditto*, Dec. 4, 1838, and *Lond. Med. Gaz.* vol. xxiii. p. 612).

The statements of Léveillé, Phillipar, (*Traité Organogr. et Phys.-Agr. sur la Carie, le Charbon, l'Ergot*, &c. 8vo. Versailles, 1837,) Smith, and Quekett, leave, I think, but little doubt that ergot is a disease of the grain caused by the presence of a parasitical fungus. This view is supported by the observations of Wiggers—that the white dust (*sporidia*, Quek.) found on the surface of ergot will produce the disease in any plant (grass ?) if sprinkled in the soil at its roots. Phœbus (*op. cit.* p. 104), who has most accurately depicted these sporidia, denies that they are spores, on the ground that they are of variable size, and enclose other smaller bodies. But these objections deserve no attention, for, in the first place, by calling these bodies sporidia, we avoid deciding whether they are sporangia or spori; and, secondly, the sporidia of other plants, of the fungic nature of which botanists entertain no doubt, also enclose smaller bodies (*sporidiola*, Berk. See *Sepedonium*, in *Eng. Flor.* vol. v. pt. ii. p. 350).

Mr. Quekett, who has most carefully examined the developement of ergot, says that the first appearance of the ergot is observed by the young grain and its appendages becoming covered with a white coating, composed of multitudes of sporidia (fig. 76, A, p. 572) mixed with minute cobweb-like filaments (*Ergotætia abortifaciens*, see p. 572, fig. 76, II, I). This coating extends over all the parts of the grain, cements the anthers and stigmas together, and gives the whole a mildewed appearance. When the grain is immersed in water, the sporidia fall to the bottom of the liquid. A sweet fluid, at first limpid, afterwards viscid, is found in the affected flower at this stage, and, when examined by the microscope, is found to contain the sporidia just referred to (Phillipar, Smith, and Quekett). Phillipar (*op. cit.* p. 111) says this fluid oozes from the floral centre; but Mr. Quekett thinks that it may have an external origin, and be, in fact, water (dew or rain) charged with sporidia; though Phœbus had previously observed that this source was very improbable.

If we examine the ergot when about half grown (figs. 94, 95, & 96), we find it just beginning to shew itself above the paleæ, and to present a purplish black colour. By this time it has lost in part its white coating, and the production of sporidia and filaments has nearly ceased. At the upper portion of the grain, the coating now presents a vermiform appearance, which Léveillé (Richards, *Elém. d'Hist. Nat.* i. 332), describes as constituting cerebriform undulations. These are beautifully depicted in Mr. Bauer's drawings (figs. 94 & 95). Léveillé regards this terminal tubercle of the grain as a parasitical fungus, which he calls the *Sphacelia Segetum.* But these undulations are merely masses of sporidia; for if a little be scraped off with a knife, then moistened, and examined by the microscope, we find nothing but myriads of sporidia. The ergot now increases in a very rapid manner.

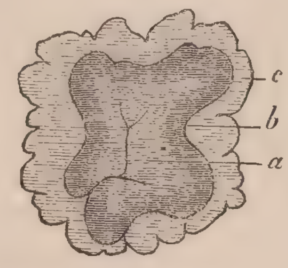
FIG. 94.

FIG. 95.

Ergot half grown, magnified about twelve times.

From Mr. Bauer's drawings in the British Museum. The ergotized grains are described as being not ripe, but advanced; the ear being unripe. Fig. 94 is a lateral view of the whole grain, at the top of which is seen the tuberculated portion with its vermiform appearance, constituting the fungus (*Sphacelia Segetum*) of Léveillé. Fig. 95 is a view of a longitudinal section of the same grain.

FIG. 96.



Magnified view of a transverse section of a grain of ergotized rye, about half grown.

The section is made about one-fourth from the top of the grain. (*Quekett*).

a, Body of the ergot.
b, Reddish-coloured coat.
c, White coat composed of sporidia, and forming the cerebriform undulations.

FIG. 97.

Mature Ergot. (Natural size.)

g, Receptacle.
h, *h*, Remains of hairy crown and stigmas.

The mature ergot (fig. 97) projects considerably beyond the paleæ. It has a violet-black colour, and presents scarcely any filaments and sporidia.

The number of grains in each spike which become ergotized varies considerably: there may be one only, or the spike may be covered with them (Phillipar, *op. cit.* p. 96). Usually, the number is from three to ten.

Besides rye, many other grasses (Phœbus has enumerated 31 species) are subject to this alteration, called the spur or ergot. In the summer of 1838 nearly all the grasses growing in Greenwich marshes were found ergotized. But the disease is not confined to the *Gramineæ*, the *Cyperaceæ* are also subject to it, and perhaps also *Palmaceæ* (Phœbus, *op. cit.* 105).

To the agriculturist, an important subject of inquiry is the predisposing causes of ergot. Very little of a satisfactory nature has, however, been

Fig. 98.

Secale cornutum.

ascertained on this point. One fact, indeed, seems to have been fully established, viz. that moisture, which was formerly thought to be the fertile source of the spur, has little, if any thing, to do with it (Phillipar, *op. cit.* 126; also, Bauer, *MSS.*)

Commerce.—Ergot is imported from Germany, France, and America. Mr. Butler, of Covent Garden Market, tells me that about 1½ tons were imported last year. The duty is five shillings per cwt.

Description of the Ergot.—Spurred rye, or ergot (*ergota*, L.), consists of grains which vary in length from a few lines to an inch, or even an inch and a half, and whose breadth is from half a line to four lines. Their form is cylindrical or obscurely triangular, with obtuse angles, tapering at the extremities (fusiform), curved like the spur of a cock, unequally furrowed on two sides, often irregularly cracked and fissured. The odour of a single grain is not detectable, but of a large quantity is fishy, peculiar, and nauseous. The taste is not very marked, but is disagreeable, and very slightly acrid. The grains are externally purplish brown or black, somewhat glaucous, moderately brittle, the fractured surface being tolerably smooth, and whitish or purplish white. Their sp. gr. is somewhat greater than that of water, though when thrown into this liquid they usually float at first, owing to the adherent air. The lower part of the grain is somewhat heavier than the upper.

When examined by the microscope, the glaucous condition of the grains is found to depend on the presence of numerous sporidia of the Ergotætia abortifaciens. The violet coat is made up of longitudinally-elongated cells. The tissue of the internal portion of the ergot is composed of the rounded cellular tissue, the cells having the form and regularity of the cells of the normal or healthy albumen, though they are smaller (Phœbus, p. 101). In each of these cells are from one to three rounded bodies, which, Mr. Quekett states, are globules of oil, for they are lighter than water, are not made blue by iodine, but are soluble in ether. If the structure of ergot be examined after the grains have been dried and remoistened, the tissue presents a most irregular appearance.

Phœbus (*op. cit.* p. 104) regards the inner substance of the ergot as the altered albumen, for the embryo does not appear to be formed. The violet coat he considers to be the external (or external and internal) degenerated seed-coat. The little heart-shaped body (*Mützchen*) at the top of the ergot (fig. 97, *h*) he regards as the remains of the degenerated and elevated pericarp, together with some other more external parts of fructification, cemented together by the violet-whitish mass (*sporidia*, Quek.) This mass, he observes, is obviously a new formation, originating from the already-described saccharine fluid. But Mr. Quekett has shown the body, at the top of the ergot, to be the remains of the hairy crown of the grain and of the stigma.

DETERIORATION.—The ergot of rye is fed on by a little acarus, which I have called *A. Ergotæ.* It is about one fourth the size of the cheese-mite. This animal destroys the interior of the ergot, and leaves the grain as a mere shell. It produces much powdery excrementitious matter (Quekett). In four months, 7½ ounces of this fæcal matter of the acarus were formed in seven pounds of ergot. I have some ergot which has been kept for three years in stoppered glass vessels without being attacked by the acarus, and it has all the characteristics of good ergot. It is advisable, however, not to use ergot which has been kept for more than two years.

FIG. 99.

Acarus Ergotæ, magnified 80 times.

COMPOSITION.—Ergot was analyzed, in 1816, by Vauquelin (*Ann. Chim.* iii. 337); in 1817, by Pettenkofer (Buchner's *Repert.* iii. 65); in 1826, by Winkler (Christison, *On Poisons*, 3d ed. 831); in 1829, by Maas (Schwartze, *Pharm. Tabell.* 2^er Ausg. 460); in 1831, by Wiggers (Phœbus, *Giftgewächse*, 102); and more recently by Chevallier (Dierbach, *Neue. Entd. in d. Mat. Med.* 1837, p. 129). The results obtained by Chevallier were analogous to those of Wiggers.

Vauquelin's Analysis.

Pale yellow matter, soluble in alcohol, and tasting like fish oil.
White bland oil, very abundant.
Violet colouring matter, insoluble in alcohol, soluble in water.
A fixed acid (phosphoric?).
Vegeto-animal or nitrogenous matter, prone to putrefaction, and yielding ammonia and oil by distillation.
Free ammonia, disengaged at 212° F.

Wigger's Analysis.

Ergotin	1·25
Peculiar fixed oil	35·00
White crystallizable fat	1·05
Cerin	0·76
Fungin	46·19
Vegetable osmazome	7·76
Peculiar saccharine matter	1·55
Gummy extractive, with red colouring matter	2·33
Albumen	1·46
Superphosphate of potash	4·42
Phosphate of lime, with trace of iron	0·29
Silica	0·14
Ergot	102·20

Ergotin was procured by digesting ergot in ether, to remove the fatty matter, and then in boiling alcohol. The alcoholic solution was evaporated, and the extract treated by water. The ergotin remained undissolved. It was brownish red, with an acrid bitter taste, and, when warmed, had a peculiar but unpleasant odour. It was soluble in alcohol, but insoluble in water or ether. It proved fatal to a hen. Nine grains of it were equal to an ounce and a half of ergot. It appears then, that though a poisonous principle, it is probably not the agent which acts on the uterus, for the latter is soluble in water, whereas ergotin is not. It is possible, however, that it may be rendered soluble in water by combination with some other body.

The substance called *vegetable osmazome* deserves further examination, as possibly being the principle from which ergot derives its influence over the uterus.

The *oil* extracted from ergot by means of ether is said, by Dr. Charles Hooker, of Connecticut (Dierbach, *op. cit.* p. 148), to produce the effects denominated ergotism, without affecting the uterus. Hence, to promote parturition, the watery infusion is always to be preferred to the powder, since it contains no oil, and, therefore, has no injurious action on the child. But these statements require further confirmation.

There are no good grounds for suspecting the existence of either hydrocyanic acid or phosphate of morphia in ergot, as supposed by Pettenkofer.

Chemical Characteristics.—Ergot is inflammable, burning with a clear yellowish white flame. The aqueous infusion or decoction of ergot is red, and possesses acid properties. Both acetate and diacetate of lead cause precipitates in a decoction of ergot. Iodine gives no indication of the presence of starch. Nitrate of silver causes a copious precipitate soluble in ammonia, but insoluble in nitric acid. Tincture of nutgalls also produces a precipitate (*tannate of ergotin?*). Alkalies heighten the red colour of the decoction.

Physiological Effects.—Great discrepancy is to be found in the accounts published respecting the influence of spurred rye on man and animals. While the majority of experimenters or practical observers concur in assigning to it energetic powers, others have declared it harmless.

(*a.*) *On Vegetables.*—Schübler and Zeller have tried its effects on plants, and I infer that they found it poisonous (Marx, *Die Lehre v. d. Giften*, ii. 107).

(*b.*) *On Animals.*—Accidental observation and direct experiment concur in shewing that in most instances spurred rye acts as a poison to the animal economy. But, as Phœbus correctly observes, we cannot call it a *violent* poison, since drachms and even ounces are required to destroy small animals (*e. g.* rabbits and pigeons).

It has proved poisonous to flies, leeches, birds (geese, ducks, pigeons, common fowls, &c.), and mammals (dogs, cats, pigs, sheep, rabbits, &c.) Birds and mammals refuse to take it even mixed with other kinds of food. Diez (quoted by Phœbus, *op. cit.* p. 106) gives the following as the symptoms produced by it in dogs who are compelled to swallow it:— "Great aversion to the ergot, discharge of saliva and mucus from the mouth, vomiting, dilatation of the pupil, quickened respiration and circulation, frequent moanings, trembling of the body, continual running round, staggering gait, semi-paralysis of the extremities, especially the hinder ones, sometimes diarrhœa; sometimes hot anus, increased formation of gas in the alimentary canal; faintness and sleepiness, with great thirst, but diminished appetite, remained. Death followed under gradually-increasing feebleness, without being preceded by convulsions. To the less constant symptoms belong inflammation of the conjunctiva, and the peculiar appearance of turning round in a circle from right to left." Similar observations as to its injurious operation have been made by Robert (Christison, *op. cit.* p. 832). In some cases, abscess and gangrene of various parts of the body, with dropping off of the toes, and convulsions, have been noticed. A strong decoction injected into the vein of a dog caused general feebleness, paralysis of the posterior extremities, vomiting, and death (Gaspard, *Journ. de Phys. expér.* ii. 35).

But there are not wanting cases apparently shewing that spurred rye has no injurious action on animals. The most remarkable and striking are those related by Block (Phœbus, *op. cit.* p. 107). In 1811, twenty sheep ate together nine pounds of it daily for four weeks without any ill effects. In another instance, twenty sheep consumed thirteen pounds and a half daily, for two months, without injury. Thirty cows took together twenty-seven pounds daily, for three months, with impunity; and two fat cows took, in addition, nine pounds of ergot daily, with no other obvious effect than that their milk gave a bad caseous cream, which did not yield good butter. These statements furnish another proof to the toxicologist that the ruminants suffer less from vegetable poisons than other mammals.

Another interesting topic of inquiry is the action of ergot on the gravid uterus of mammals. Chapman (*Elem. of Thérap.* i. 489, 4th ed.) says, "it never fails, in a short time, to occasion abortion." We have the testimony of Percy and Laurent, that a decoction injected into the veins of a cow caused the animal to calve speedily; and in one out of three experiments, Mr. Combes has stated, the ergot caused the abortion of a bitch (Neal, *Researches respect. Spur or Ergot of Rye*, p. 90). Diez (Phœbus, p. 106) found that it caused uterine contractions in dogs, rabbits, and sows. Large doses given to bitches induced an inflammatory condition of the uterus, and destroyed both mother and her young. However, in opposition to these statements, we have the evidence of Chatard, Warner, Villeneuve, and others, who failed in producing abortion with it (Neal, *op. cit.*)

I am indebted to Mr. Youatt, Professor of Veterinary Surgery to University College, Veterinary Surgeon to the Zoological Society, and Editor of the *Veterinarian*, for the following note respecting the effects of ergot on animals:—

"I have, for the last six or seven years, been in the habit of administering the ergot of rye to quadrupeds in cases of difficult or protracted parturition, in order to stimulate the uterus to renewed or increased action. In the *monogastric*, if I may venture to use the term, I have never known it fail of producing considerable effect, even when the uterus had been previously exhausted by continued and violent efforts. In the *ruminant*, with its compound stomach or stomachs, I have witnessed many a case of its successful exhibition. I have had recourse to it in the cow, the sheep, and the deer, both foreign and domestic. Parturition has not always been accomplished, from false presentation or other causes, but the uterus has in every case responded—it has been roused to a greater or less degree of renewed action. On the other hand, there are cases recorded by veterinary practitioners, in which it has been given in very large quantities without producing the slightest effect. I have always attributed this to a certain degree of forgetfulness of the construction of the stomachs of ruminants. If the medicine, as is too often the case, is poured hastily down, and from a large vessel, it breaks through the floor of the œsophagean canal and falls into the rumen, and there it remains perfectly inert. But if it is suffered to trickle down the œsophagean canal, although a portion of it may still enter the rumen, the greater part will flow on through the œsophagean canal and the manyplies into the fourth or villous stomach, and produce the desired effect."

(*c.*) *On man.*—These may be noticed under two heads: 1, effects of single doses; 2, effects of its continued use as an article of food.

1. *In single or a few doses.*—Hertwig (Sundelin, *Heilmittell.* i. 513, 3te Aufl.), Lorinser (*Edin. Med. and Surg. Journ.* xxvi. 453), Jörg (*Gebrauch inn. Reizm. z. Beförd. d. Geburt.* 1833), and Diez (Phœbus, *op. cit.* 106), who have endeavoured to ascertain the effects of ergot by experiment, agree in stating that, in doses of from half a drachm to two drachms, nausea, inclination to vomit, dryness of the throat, great thirst, aversion

to food, uneasiness or actual pain in the abdomen, occasionally alvine evacuations, weight and pain in the head, giddiness, in some cases stupor and dilatation of pupils, have resulted from its use. It deserves, however, to be noticed, that these effects have not been noticed by some experimenters (Keil, *Diss. inaug. de Secali Cornuto*, Berol. 1822, quoted in Sundelin, *Heilmittell;* also, Dr. Chapman, *Elem. of Thérap.* vol. i. p. 488, 4th ed.)

The effects produced by the use of single or a few doses of ergot may be conveniently arranged under four heads.

a. Effects on the uterine system. (Uterine contractions.)—The action of spurred rye on the uterus *when labour has actually commenced*, is usually observed in from ten to twenty minutes after the medicine has been taken, and is manifested by an increase in the violence, the continuance, and the frequency of the pains, which usually never cease until the child is born; nay they often continue for some minutes after, and promote the speedy separation of the placenta and the firm contraction of the uterus into a globular form. The contractions and pains caused by ergot are distinguished from those of natural labour by their continuance: scarcely any interval can be perceived between them, but a sensation is experienced of one continued forcing effort. If from any mechanical impediment (as distortion) the uterus cannot get rid of its contents, the violence of its contraction may cause its rupture, as in the case alluded to by Dr. Merriman (*Syn. of Diff. Part.* p. 197, 1838. Did the ergot cause the rupture, in the case related in the *Lancet*, vol. i. 1836-7, p. 824, by Mr. Hooper?)

Ergot sometimes fails to excite uterine contractions. The causes of failure are for the most part conjectural. The quality of the ergot, peculiarities on the part of the mother, and the death of the fœtus, have been assigned as such. The two first will be readily admitted; but why the remedy should be altogether inert "where the fœtus has been for some time dead, and putrefaction to any extent taken place" (Dr. Bibby, in Merriman's *Synopsis*, p. 198), cannot be readily explained. Its occasional failure has been urged by Dr. Hamilton (*Pract. Observ. relating to Midwifery*, part ii. p. 84, 1836) as an argument in favour of his notion that ergot acts "in no other way than by influencing the imagination." But on the same ground the sialogogue power of mercury might be denied. Dr. Hamilton's erroneous estimate of the powers of ergot is referrible to a want of experience of its use; for he admits that he has only had two opportunities in practice of making a fair trial of it.

There is usually much less hemorrhage after delivery, when ergot has been employed, than where it has not been exhibited. The lochial discharges are also said to be less: but this is certainly not constantly the case. Moreover, it has been asserted "that the menstrual discharge has not recurred after the use of the ergot in certain cases of protracted parturition" (Dr. J. W. Francis, in the 3d Amer. ed. of Denman's *Midwifery*, 1829). But the inference intended to be conveyed here, viz. that ergot caused the non-recurrence, is not correct; at least, I am acquainted with several cases in which this effect did not follow the employment of spurred rye, and I know of none in which it did.

Ergot has been charged with causing the death of the child; but the charge has been repelled by some experienced practitioners as being devoid of the least foundation. "The ergot," says Dr. Hosack (*Essays,* vol. ii. 296) "has been called, in some of the books, from its effects in hastening labour, the *pulvis ad partum*; as it regards the child, it may with almost equal truth be denominated the *pulvis ad mortem*, for I believe its operation, when sufficient to expel the child, in cases where nature is alone unequal to the task, is to produce so violent a contraction of the womb, and consequent convolution and compression of the uterine vessels, as very much to impede, if not totally to interrupt, the circulation between the mother and child." However, Dr. Chapman (*Elem. of Thérap.* i. 488, 4th ed.) strongly denies this charge, and tells us that in 200 cases which occurred in the practice of himself and Drs. Dewees and James, the ergot was used without doing harm in any respect; and he adds, "no one here believes in the alleged deleterious influence of the article on the fœtus." It is not improbable, however, where the impediment to labour is very great, that the violent action of the uterus may be attended with the result stated by Dr. Hosack. But where no difficulty of this kind exists, no danger is to be apprehended. Dr. F. H. Ramsbotham (*Lond. Med. Gaz.* vol. xiv. p. 84) has suggested that the poisonous influence of ergot may be extended from the mother to the fœtus, as in the case of opium; but if this were the case, the death of the child after the use of ergot would be more frequent than it is.

Given to excite abortion, or premature labour, ergot has sometimes failed to produce the desired effect. Hence many experienced accoucheurs have concluded, that for this medicine to have any effect on the uterus it was necessary that the process of labour should have actually commenced (Bayle, *Bibl. Thérap.* iii. 550). But while we admit that it sometimes fails, we have abundant evidence to prove that it frequently succeeds; and most practitioners, I think, are now satisfied, that, in a large number of cases, it has the power of originating the process of accouchement. Cases illustrating its power in this respect are referred to by Bayle (*op. cit.* p. 550); and others are mentioned by Waller (*Lancet*, 1826, vol. x. p. 54), Holmes (*Lancet*, 1827-8, vol. ii. p. 794), Ramsbotham (*Lond. Med. Gaz.* xiv. pp. 85 and 434), Müller (Dierbach, *Neueste Entd. in d. Mat. Med*, i. 139, 1837), and others.

The action of ergot *on the unimpregnated uterus* is manifested by painful contractions frequently denominated "bearing-down pains," and by the obvious influence which it exercises over various morbid conditions of this viscus; more particularly by its checking uterine hemorrhage, and expelling polypous masses. Tenderness of the uterus, and even actual metritis, are said to have been induced by ergot (Dr. Negri, *Lond. Med. Gaz.* xiv. 369).

β. Effects on the Cerebro-Spinal System. (*Narcotism.*)—Weight and pain in the head, giddiness, delirium, dilatation of pupil, and stupor, are the principal symptoms which indicate the action of ergot of rye on the brain. Dr. Maunsell (*Lond. Med. Gaz.* xvi. 606) has published five cases (viz. two which occurred to Dr. Churchill, one to Dr. Johnson, and two to Dr. Cusack), in which delirium or stupor resulted from the use of ergot (in half drachm and two drachm doses), and was accompanied by great depression of pulse (see also Dr. Cusack, in *Dubl. Hosp. Rep.* vol. v. p. 508). Trousseau and Pidoux (*Traité de Thérap.* i. 546) found that, under the repeated use of ergot, dilatation of pupil was the most common symptom of cerebral disorder. It began to be obvious in from twelve to twenty-four hours after the commencement of the use of the medicine, and sometimes continued for several days after its cessation. The cerebral disorder is frequently preceded by the uterine contractions, and usually remains for some time after these have subsided.

γ. *Effects of ergot on the circulatory system.*—I have known increased frequency and fulness of pulse, copious perspiration, and flushed countenance, follow the use of ergot during parturition. But in some instances the opposite effect has been induced: the pulse has been greatly diminished in both frequency and fulness, and the face has become livid. In one case, mentioned by Dr. Cusack (Dr. Maunsell, *Lond. Med. Gaz.* xiv. 606), the pulse was reduced from 120 to 90. Dr. Maunsell has referred to four other cases. These effects on the circulatory system were accompanied with cerebral disorder, of which they were probably consequences. Similar observations as to the power of ergot to diminish the frequency of the pulse have been noticed by others (Merriman, *Synopsis*, pp. 201 and 203, 1838; Trousseau and Pidoux, *Traité de Thérap.* i. 547).

δ. *Other effects of ergot.*—Nausea and vomiting are not uncommon consequences of the exhibition of ergot when the stomach is in an irritable condition. Various other symptoms have been ascribed to the use of ergot, such as weariness of the limbs and itching of the skin (Trousseau and Pidoux, *op. cit.* i. 547).

2. *Effects produced by the continued use of ergot as an article of food* (*Ergotism*, Fr.; *Raphania*, Linn. Vog. Cull. Good; *Convulsio raphania, and Eclampsia typhodes*, Sauv.; *Morbus spasmodicus*, Rothm.; *Morbus convulsivus, malignus, epidemicus, cerealis, &c.* Alt.; *Kriebelkrankheit, or the creeping sickness*, Germ.)—Different parts of the continent, *e. g.* France (especially in the district of Sologne), Silesia, Prussia, Bohemia, Saxony, Denmark, Switzerland, and Sweden, have been, at various periods, visited with a dangerous epidemic (known by the names above mentioned), which affected, at the same time, whole districts of country, attacking persons of both sexes and of all ages (Tissot, *Phil. Trans.* vol. 55; Rothman, *Amœn. Acad.* vi. 430). So long back as 1597 (Tissot) the use of ergotized rye was thought to be the cause of it. Various circumstances have appeared to prove the correctness of this opinion (*Mém. de la Soc. Roy. de Méd.* i. 1777), which has been further confirmed by the effects of ergot on animals, as well as by the occurrence of a disease similar to, if not identical with, ergotism, in consequence of the use of damaged wheat (*Phil. Trans.* for 1762). Yet, several intelligent writers have not acquiesced in this view; and the circumstances mentioned by Trousseau (*Traité de Thérap.* i. 527), and by Dr. Hamilton (*Pract. Observ. relat. to Midw.* pt. ii. p. 85), are certainly calculated to throw some doubts over the usually received opinion.

Ergotism assumes two types, the one of which has been denominated the *convulsive*, the other the *gangrenous ergotism.* Whether these arise from different conditions of the ergot, or from peculiarities on the part of the patient, or from the different quantity of the ergot taken, we are hardly prepared now to say. In *convulsive ergotism* the symptoms are weariness, giddiness, contraction of the muscles of the extremities, formication, dimness of sight, loss of sensibility, voracious appetite, yellow countenance, and convulsions, followed by death. In the *gangrenous ergotism* there is also experienced formication, that is, a feeling as if insects were creeping over the skin, voracious appetite, coldness and insensibility of the extremities, followed by gangrene (Christison, *Treat. on Poisons*, 3d ed. p. 833 ; Orfila, *Toxicol. Gén.*)

Uses.—To Dr. Stearns, of the United States, is due the credit of introducing ergot of rye to the notice of the profession as an agent specifically exciting uterine contractions (*New York Med. Repos.* vol. xi. 1807, quoted in the *United St. Dispens.*) In 1814 a paper was published by Mr. Prescot (*Med. and Phys. Journ.* vol. xxxii. p. 90, 1815), on the effects of it in exciting labour-pains, and in uterine hæmorrhage. It was not employed in England until 1824. The following are the principal uses of it:—

1. *To increase the expulsatory efforts of the womb in protracted or lingering labours.*—When the delay of delivery is ascribable solely to the feeble contractions of the uterus, ergot is admissible, provided, first, that there is a proper conformation of the pelvis and soft parts ; secondly, that the os uteri, vagina, and os externum, be dilated, or readily dilatable, and lubricated with a sufficient secretion ; and, lastly, that the child be presenting naturally, or so that it shall form no great mechanical impediment to delivery. A natural position of the head is not an absolute essential for the use of ergot, since this medicine is admissible in some cases of breech presentation (Dr. F. H. Ramsbotham, *Lond. Med. Gaz.* xiv. 86). The circumstances which especially contra-indicate or preclude the use of this medicine are those which create an unusual resistance to the passage of the child: such are, disproportion between the size of the head and of the pelvis, great rigidity of the soft parts, and extraneous growths. Moreover, "earliness of the stage" of labour is laid down by Dr. Bigelow (*Quart. Journ. of Lit. Science, and Arts*, ii. 63) as a circumstance contra-indicating the use of ergot. The proper period for its exhibition is when the head of the child has passed the brim of the pelvis. Some practitioners assert that a dilated or lax condition of the os uteri is not an essential requisite for the exhibition of ergot. It has even been contended that one of the valuable properties of this medicine is to cause the dilatation of the uterine orifice, and cases are not wanting to confirm these statements (Bayle, *op. cit.* p. 539).

2. *To hasten delivery when the life of the patient is endangered by some alarming symptom.*—Thus, in serious hemorrhages occurring during labour, after the rupture of the membranes, and where the placenta is not situated over the os uteri, the ergot is especially indicated (Dr. Blundell, *Lancet* for 1827-8, vol. i. p. 805 ; Dr. F. H. Ramsbotham, *Lond. Med. Gaz.* vol. xiv. pp. 86 and 692). It has also been employed to accelerate delivery in puerperal convulsions. Five successful cases of its use are recorded by Bayle (*Bibl. Thérap.* iii. 448 and 548), on the authority of Waterhouse, Mitchell, Roche, Brinkle, and Godquin. But the narcotic operation of ergot presents a serious objection to its use in cerebral affections.

3. *To provoke the expulsion of the placenta when its retention depends on a want of contraction in the uterus.*—In such cases ergot has often proved of great advantage (Dr. Blundell, *Lancet*, 1827-8, vol. ii. 259 ; Bayle (*Bibl. Thérap.* vol. iii. 541) has recorded nine cases, from Balardini, Bordol, Davies, Duchâteau, and Morgan ; and many others will be found in the medical journals). When the hemorrhage is excessive the ergot must not be regarded as a substitute for manual extraction, since,

during the time required for its operation, the patient may die from loss of blood (Dr. F. H. Ramsbotham, *Lond. Med. Gaz.* xiv. 738). In retention of the placenta from spasmodic or irregular contraction of the uterus, as well as from morbid adhesion, ergot is improper or useless (Dr. Jackson, *Lond. Med. Gaz.* iv. 105).

4. *To provoke the expulsion of sanguineous clots, hydatids, and polypi from the uterus.*—Coagula of blood collected within the womb after delivery may sometimes require the use of ergot to excite the uterus to expel them, as in the case mentioned by Mackenzie (Neal, *Researches*, p. 88). Ergot is also valuable in promoting the expulsion of those remarkable formations called uterine hydatids (*Acephalocystis racemosa*, H. Cloq.), and which are distinguished from the acephalocysts of other parts of the body by their not possessing an independent life, so that when separated from their pedicles they die (*Cruveilhier, Dict. de Méd. et de Chir. prat.* art. Acéphalocystes, p. 260). A successful case of the use of ergot in this affection has been published by Dr. Macgill (Bayle, *op. cit.* p. 471). In uterine polypus, ergot has been exhibited with the view of hastening the descent of the tumor from the uterus into the vagina, so as to render it readily accessible for mechanical extirpation (Dr. H. Davies, *Lond. Med. and Phys. Journ.* v. 54, p. 102, 1825); for it is well known, that until this is effected, the patient is continually subject to hemorrhage, which, in some cases, proves fatal. In some instances ergot has caused the expulsion of a polypus (*Lancet*, 1828-9, vol. i. p. 24).

Fig. 100.

Uterine Hydatids.

a, Membrane to which they are mediately or immediately attached.
b, Hydatids hanging to each other by pedicles.

5. *To restrain uterine hemorrhage, whether puerperal or non-puerperal.*—Ergot checks hemorrhage from the womb, principally, if not solely, by exciting contraction of the muscular fibres of this viscus, by which its blood-vessels are compressed and emptied, and their orifices closed. The experience of physicians and surgeons in all parts of the civilized world has fully and incontestibly established the efficacy of ergot as a remedy for uterine hemorrhage (see the list of cases in Bayle's *Bibl. Thérap.* iii. 543). Maisonneuve and Trousseau (*Bull. de Thérap.* t. iv.; also, Trousseau and Pidoux, *Traité de Thérap.* i. 540) have shewn that the beneficial influence of ergot is exerted equally in the unimpregnated as in the impregnated state; proving, therefore, that the contrary statement of Prescott and Villeneuve is incorrect. Even in a case of cancer of the uterus they have found it check the sanguineous discharge. In females subject to profuse uterine hemorrhages after delivery, ergot may be administered as a preventive, just before the birth of the child (Roche, *Dict. de Méd. et Chir. prat.* art. Ergot, p. 455). Even in pla-

centa presentations, a dose or two of ergot may be administered previously to the delivery being undertaken (Dr. F. H. Ramsbotham, *Lond. Med. Gaz.* xiv. 660). To restrain excessive discharge of the lochia or of the catamenia, this remedy is sometimes most beneficial.

6. *To provoke abortion.*—Under certain circumstances the practitioner finds it expedient to produce abortion: as in serious hemorrhage during pregnancy, and in deformed pelves which do not admit the passage of a full-grown fœtus. In such cases the ergot may be employed with great advantage (Dr. F. H. Ramsbotham, *Lond. Med. Gaz.* xiv. 434; also, Dr. Weihe, in *op. cit.* vol. xviii. 543). When abortion has already commenced, ergot may be employed, to quicken the process and check hemorrhage.

7. *In leucorrhœa and gonorrhœa.*—Ergot was first given in leucorrhœa by Dr. M. Hall (*Lond. Med. and Phys. Journ.* May 1829); and was subsequently employed by Dr. Spajrani (*Lancet*, Feb. 5th, 1831) with success; and in eight cases by Dr. Bazzoni (*Bayle*, p. 509), seven of these were cured by it. Dr. Negri (*Lond. Med. Gaz.* xiii. p. 369) published seven successful cases of its use. Its efficacy has been confirmed by many other practitioners. Dr. Negri also used it with apparent benefit in gonorrhœa, in both the male and female. He concludes that "secale cornutum has a peculiar action on the mucous membranes; but if exhibited when there is a state of acute inflammation, their morbid secretions may be considerably increased; on the contrary, when a more chronic form of inflammation does exist, the secale cornutum may have a beneficial influence in arresting their preternatural discharge."

8. *In hemorrhages generally.*—The power possessed by ergot of exciting uterine contractions, readily explains the efficacy of this agent in restraining sanguineous discharges from the womb; but we can in no way understand how hemorrhage from other organs can be influenced by it. We are not, however, to deny the therapeutic power of a medicine merely because we cannot explain its *modus medendi*, though we are justified in requiring abundant proofs ere we admit it. It must be acknowledged, that a considerable number of cases have been published in proof of the power possessed by ergot of checking hemorrhage from other organs (as the nose, gums, chest, stomach, and rectum) than the uterus (see the cases of Drs. Spajrani, Pignacco, and Gabini, in the *Lancet* for 1830 and 1831; of Dr. Negri, in the *Lond. Med. Gaz.* xiii. 361). But having found it unsuccessful in my own practice, seeing that in the hands of others it has also failed (Trousseau and Pidoux, *Traité de Thérap.* i. 546), and knowing how difficult it is to ascertain the influence of remedies on hemorrhages, I think further evidence is required to prove the anti-hemorrhagic powers of ergot.

9. *In amenorrhœa.*—Some few cases have been published tending to shew that ergot possesses emmenagogue properties (Neal, *Researches*, p. 79). It appears to me to be more calculated to cause than to relieve amenorrhœa.

10. *In other diseases.*—Ergot has been employed in various other diseases with apparent success: viz. intermittent fever (Dierbach, *op. cit.* p. 144), paraplegia (Bayle, *op. cit.* p. 548), &c.

Administration.—Ergot is usually given in the form either of powder or infusion. The decoction, less frequently the tincture, and still more rarely the extract, are also used.

1. *Pulvis Secalis cornuti. Pulvis Ergotæ.*—This powder is only to be prepared when required for use. The dose of it, for a woman in labour, is twenty grains; to be repeated at intervals of half an hour for three times: for other occasions (as leucorrhœa, hemorrhages, &c.) five to ten or fifteen grains, three times a day: its use should not be continued for any great length of time. It may be taken mixed with powdered sugar. It has had the various names of *pulvis parturiens* (more correctly *parturifaciens*), *pulvis ad partum, pulvis partum accelerans, obstetrical powder, &c.*

2. *Infusum Secalis cornuti. Infusum Ergotæ.*—Ergot, bruised. ʒj. boiling water, f.ʒiv. macerate until cold, in a slightly covered vessel, and strain. The dose, for a woman in labour, is one-third or one half of this, to be repeated, at intervals of half an hour, until the whole be taken. Sugar, aromatics (as nutmeg or cinnamon), or a little wine or brandy, may be added to flavour it.

3. *Decoctum Secalis cornuti. Decoctum Ergotæ.*—Ergot, bruised, ʒj.; water, f.℥vj. Boil for ten minutes in a lightly covered vessel, and strain. The dose is one-third of the strained liquor, to be repeated at intervals of half an hour, until the whole be taken.

4. *Tinctura Secalis cornuti. Tinctura Ergotæ.*—Ergot, bruised, ʒss.; rectified spirit, ℥vj.; digest for four days, and strain. The dose in lingering labours is a teaspoonful. This is the formula of Dr. Robert (Dierbach, *Neueste Entd. in d. Mat. Med.* i. 147, 1838). A tincture is recommended by Carus (*Lehrb. d. Gynäcologie*, i. 280, 1827). At Apothecaries' Hall, London, *tincture of ergot* is prepared by digesting ergot, ℥ij. in proof spirit, Oj. Another formula has been published (*Lancet*, 1827-8, vol. ii. p. 435):—Ergot, bruised, ℥j.; boiling, water, ℥ij. Infuse for twenty-four hours, and add rectified spirit, ℥iss. Digest for ten days. Half a drachm of this tincture is said to be equivalent to ten grains of the powder. One or two spoonfuls of a tincture of ergot (prepared by digesting ℥ss. of ergot in ℥iv. of rectified spirit) mixed with water, has been recommended as an injection into the uterus in difficult labour. It is to be introduced between the head of the child and the neck of the uterus (Berlin. *Jahrbuch.* Bd. xxxviii. 234, 1837).

Antidote.—The proper treatment to be adopted in a case of poisoning by an overdose of ergot has not been accurately determined. The first object would be, of course, to evacuate the poison from the alimentary canal by the use of emetics or purgatives. As chlorine decomposes ergotin, Phœbus recommends the employment of chlorine water (p. 108). In the absence of this, nitrohydrochloric acid (properly diluted) might be exhibited. The subsequent treatment should be conducted on general principles.

Other Cerealia.

Rice (*Oryza sativa*, fig. 101) is the ordinary sustenance of many oriental nations. Being less laxative than the other cereal grains, it is frequently prescribed by medical men as a light, digestible, uninjurious article of food in diarrhœa and dysentery; and in consequence it is, with the public, a reputed drying and astringent agent. Various ill effects, such as disordered vision, &c. have been ascribed to the use of rice (Bontius, *Account of the Diseases, Nat. Hist. &c. of the East Ind.* transl. into English, p. 129, 1769; and Bricheteau, in Tortuelle's *Elém. d'Hygiène,* 4me. ed.); but without any just grounds. Neither does there appear to be any real foundation for the assertions of Dr. Tytler (*Lancet*, 1833-4, vol. i.), that malignant cholera (which he

Fig. 101.

Oryza sativa.

Fig. 102.

Panicum miliaceum.

Fig. 103.

Zea Mays.

:alls *morbus oryzeus!*) is induced by it. *Common Millet* (*Panicum miliaceum*, fig. 102,) ınd *Italian Millet* (*Setaria italica*), are cultivated in Italy as articles of food. *Maize* or *Indian Corn* (*Zea Mays*, fig. 103) is nutritive; but being deficient in gluten, is not adapted for manufacture into bread. It is apt to occasion diarrhœa n those unaccustomed to it (Dunglison, *Elem. of Hygiène*, p. 289). In America, Asia, ınd some parts of Europe, it is used largely for human sustenance. (For further nformation respecting Maize, consult Cobbett's *Treat. on Cobbett's Corn*; *Quart. Journ. Agric.* i.; and *Mém. de l'Acad. Roy. de Méd.* t. ii. p. 206, Paris, 1833).

Order 8. Acora'ceæ, *Lindl.*—The Sweet Flag Tribe.

Acoroideæ, *Agardh, Schott.*

Essential Character.—*Flowers* hermaphrodite, surrounded with scales. *Spathe* leaf-like, not rolled up. *Stamens* complete, opposite the scales, with two-celled anthers turned inwards. *Ovaries* distinct. *Fruit* baccate, finally juiceless. *Seeds* albuminous, with the embryo in the axis. *Rhizome* jointed. *Leaves* ensiform, embracing each other in the bud (*Schott*).

Properties.—Acorus Calamus is the only plant of the family whose properties are known.

Ac'orus Cal'amus, Lin. L. E.—*Common Sweet Flag.*

Sex. Syst. Hexandria, Monogynia.

(Rhizoma, *L.* Radix, *E.*)

History.—This is probably the ἄκορον of Dioscorides (lib. i. cap. 2). Dr. Royle says that in Persian works *akoron* is given as its Greek appellation. It must not be confounded with the κάλαμος ἀρωματικὸς of Dioscorides, which, according to Dr. Royle (*Essay on the Antiq. of Hindoo Med.* p. 33), is *Andropogon Calamus aromaticus*, Royle (vide p. 580).

Botany. *Gen. Char.*—*Flowers* arranged upon a *spadix*. *Spatha* none. *Perianth* of six pieces or scales, inferior. *Stigma* sessile. *Capsule* indehiscent. (*Hooker.*)

Sp. Char.—Ancipitate [two-edged] *scape* rising much above the spadix. (*Hooker.*)

Rhizome thick, rather spongy, with many long roots, aromatic, like every part of the herbage, but much more powerfully so. *Leaves* erect, two or three feet high, bright green, near an inch broad. *Stalk* like the leaves, except being thicker below the *spadix*, and not quite so tall. *Spadix* about a foot above the root, a little spreading, two or three inches long, tapering, covered with a mass of very numerous, thick-set, pale green *flowers*, which have no scent, except when bruised. A very narrow wavy membrane may be observed at the base of the spadix, which, perhaps, ought to be taken into the generic character as a *spathe* (*Smith*). Perennial; flowers in June.

Hab.—It is a native of this country, growing in watery places about the banks of rivers, and is very plentiful in the rivers of Norfolk, whence the London market is supplied. It grows also in other countries of Europe, in Asia, and in the United States.

Description.—The dried underground stem (*rhizoma*, L.; *radix*, E.; *radix acori veri* seu *radix calami aromatici*, Offic.) occurs in the shops in flattened pieces four or five inches long, and about as broad as the thumb; jointed, somewhat curved, of a spongy or corky texture internally; of a yellowish brown or fawn colour externally, and buffy, with a slightly roseate hue, internally. Their fracture is short; their upper surface is marked transversely with the vestiges of the leaves which were attached to it; the lower surface has numerous dark points, surrounded by small light-coloured elevated circles, from which the roots arise. Their taste is warm and bitter; their odour is aromatic. In Germany, the rhizome is usually peeled before drying it (*rhizoma decorticata*); but the operation is unnecessary and wasteful. In this state the rhizome is greyish white and easily pulverizable.

The rhizome should be gathered in spring or late in the autumn, and dried quickly.

The rhizome of the Yellow Water Iris (*Iris Pseud-acorus*) is said to be sometimes substituted for that of the true Acorus.

Composition.—The fresh rhizome was analyzed by Trommsdorf (Gmelin, *Handb. d. Chem.* ii. 1339), who obtained the following results:—*Volatile oil*, 0·1; *soft resin*, 2·3; *extractive, with a little chloride of potassium*, 3·3; *gum, with some phosphate of potash*, 5·5; *starchy matter* (like inulin), 1·6; *woody fibre*, 21·5; and *water*, 65·7. Meissner found traces of copper in the ashes.

The active constituents are the oil, the resin, and the extractive.

Oil of the common sweet flag (called in the shops *oleum calami aromatici*) is obtained by distilling the fresh rhizome with water. Its odour is similar to, though less agreeable than, that of the rhizome. Its colour is yellow. It is imported by the wholesale dealers in perfumery, and is bought by snuff-makers, so that it is used, I presume, for scenting snuff.

Chemical Characteristics.—Iodine blackens the rhizome (especially when it has been boiled), thereby indicating the presence of starch. The cold decoction of the rhizome forms, with a solution of iodine, the blue *iodide of starch*. Acetate and diacetate of lead, and protonitrate of mercury, cause precipitates with the decoction. These precipitates consist principally of metallic oxides or subsalts and the substance called extractive. Nitrate of silver produces a precipitate (*chloride of silver*), which is insoluble in nitric acid, but soluble in ammonia. The decoction reddens litmus.

PHYSIOLOGICAL EFFECTS.—It is an aromatic stimulant and mild tonic. Vogt (*Lehrb. d. Pharmakodyn.* i. 454, 2te Aufl.) arranges it with the *excitantia volatilia*, and regards it as approaching angelica root on the one hand, and cascarilla and angustura barks on the other.

USES.—It is rarely employed by medical practitioners, though it might be frequently substituted, with good effect, for the more costly oriental aromatics. It is a useful adjunct to other stimulants and tonics. It has been employed in continued asthenic fevers accompanied with much prostration of strength and greatly weakened digestive power. For the cure of ague, the dried root powdered is used by the country people in Norfolk (Sir J. E. Smith, *Engl. Flora*, ii. 158). It is well adapted for dyspeptic cases accompanied with, or dependent on, an atonic condition of the digestive organs, and is especially serviceable in gouty subjects. It has also been used as a local agent, viz. in the formation of aromatic baths, poultices, and gargles, as an application to foul-conditioned ulcers, &c.

ADMINISTRATION.—In *powder*, the rhizome may be given in doses of from a scruple to a drachm. The *infusion* is perhaps the most eligible preparation: it is made by digesting ℥j. of the rhizome in ℥xij. of boiling water; the dose is two or three table-spoonfuls. The *decoction* is an objectionable preparation, as the oil of the rhizome is dissipated by boiling. The *tincture* (Ph. Bor.) is procured by digesting ʒij. of the rhizome in ℥xij. of spirit (sp. gr. 0·900); the dose is a tea-spoonful.

ORDER 9. ARA′CEÆ, *Schott, Lindl.*—THE ARUM TRIBE.

FIG. 104.

Arum maculatum.
a, The spathe.
b, The spadix.

FIG. 105.

Arum Colocasia.

This order is distinguished from the preceding one by its naked unisexual flowers, arranged upon a spadix within a spathe. Its prevailing property is acridity, especially remarkable in *Dieffenbachia Seguina*, or the Dumb Cane, a native of the West India Islands, two drachms of whose juice have been known to prove fatal in two hours. *Arum maculatum* (Wake Robin, or Cuckow-pint, fig. 104) is the only indigenous plant of the order. Every part of it is acrid; but, by drying or heating, it loses this property. From the underground tubers is manufactured, in the island of Portland, a feculent substance, called *Portland Sago*. *Arum Colocasia* (fig. 105) is cultivated in Egypt for the nutritious matter got from the tubers. *Arum esculentum* is cultivated in the West Indies for a similar purpose.

ORDER 10. PAL'MÆ, *Juss.*—THE PALM TRIBE.

PALMACEÆ, *Lindl.*

FIG. 106.

Cocos nucifera.

a, shews the one-valved spathe, with a branched spadix.
b, The fruit, a fibrous drupe.

FIG. 107.

Cucifera thebaica, or *Doum Palm*, remarkable for its dichotomous stem.

ESSENTIAL CHARACTER.—*Flowers* hermaphrodite, or frequently polygamous. *Perianth* six-parted, in two series, persistent; the three outer segments often smaller, the inner sometimes deeply connate. *Stamens* inserted into the base of the perianth, usually definite in number, opposite the segments of the perianth, to which they are equal in number, seldom three; sometimes, in a few polygamous genera, indefinite in number. *Ovary* one, three-celled, or deeply three-lobed; the lobes or cells one-seeded, with an erect ovule, rarely one-seeded. *Fruit* baccate or drupaceous, with fibrous flesh. *Albumen* cartilaginous, and either ruminate or furnished with a central or ventral cavity; *embryo* lodged in a particular cavity of the albumen, usually at a distance from the hilum, dorsal and indicated by a little nipple, taper or pulley-shaped; *plumule* included, scarcely visible; the cotyledonous extremity becoming thickened in germination, and either filling up a pre-existing cavity, or one formed by the liquefaction of the albumen in the centre.—*Trunk* arborescent, simple (fig. 106), occasionally shrubby and branched (fig. 107), rough with the dilated half-sheathing bases of the leaves or their scars. *Leaves* clustered, terminal, very large, pinnate or flabelliform, plaited in vernation. *Spadix* terminal, often branched, enclosed in a one or many valved spathe (fig. 106 *a*). *Flowers* small, with bractlets. *Fruit* occasionally very large. (*R. Brown*, 1810.)

PROPERTIES.—The *stems* of many palms (e. g. *Sagus lævis* and *farinifera*, *Saguerus Rumphii*, *Phœnix farinifera*, and *Caryota urens*) yield a feculent matter, called *sago*. By incision into the spathe at the top of the stems of some (e. g. *Cocos nucifera*, *Caryota urens*, and *Saguerus Rumphii*), a saccharine liquor, termed *sweet toddy*, is procured, which, when fermented, constitutes *palm wine*, and yields by distillation *arrack* or *rack*. A waxy substance exudes from the stems of some (e. g. *Ceroxylon Andicola*). The *fruits* of the palms want uniformity in their properties: thus, some are oily (e. g. *Elaïs*), some are saccharine and nourishing (e. g. *Phœnix dactylifera*), some are acrid (e. g. *Caryota urens* and *Saguerus Rumphii*), others are astringent (e. g. *Latania borbonica*), or acid (e. g. *Calamus Rotang*). The *seeds*, likewise, are not uniform: those of *Cocos nucifera* are oleaginous, while those of *Areca Catechu* are astringent.

Sa'gus Rum'phii, Willd. L.—*The Malay* or *Rumphius's Sago-Palm.*

Sagus farinifera, *Gærtn.*

Sex. Syst. Monœcia, Hexandria.

(Sago; Fæcula caudicis. Sago; Medullæ fæcula, *Lond.*)

History.—Sago is not mentioned by the ancient Greeks and Romans. Fern. Lopez (*Hist. dell' Ind. Orient.* Ven. 1578) is the first author in whose works I have found a notice of it. By the earlier writers it was variously called *zagu*, *sagu*, and *saga* (C. Bauhin, *Pinax*). In Java the word Saga signifies bread (Sir F. Drake, in Hakluyt's *Princip. Navigations, Voyages*, &c. vol. iii. p. 742).

Botany. *Gen. Char.*—*Spathes* many. *Spadix* (terminal) superdecompound. *Male: Calyx* three-toothed. *Corolla* three-parted. *Stamina* inserted on the base of the corolla. *Female: Calyx* and *Corolla* as in the male. *Stamina* abortive. *Style* three-parted. *Berry* backwardly imbricated with cartilaginous scales. *Seed* solitary. *Embryo* lateral. (*Roxburgh.*)

Fig. 108.

Sagus Rumphii.

a, The tree.
b, The shrub.
c, Fruit-bearing spadix.
d, Ripe fruit.

Sp. Char.—Arboreous, armed, with strong straight spines. *Leaves* pinnate. (*Roxburgh.*)

The stature of this tree seldom exceeds thirty feet. Before maturity, and previous to the formation of the fruit, the stem consists of a thin hard wall, about two inches thick, and of an enormous volume of tissue (commonly termed the *medulla* or *pith*), from which the farina, called sago, is obtained. As the fruit forms, the farinaceous medulla disappears, and when the tree attains full maturity, the stem is no more than a hollow shell. The utmost age of the tree does not exceed thirty years.

Hab.—Peninsula of Malacca and the Malay Islands. It is an inhabitant of low marshy situations.

Sa'gus læ'vis, Rumph.—*The Unarmed Sago-Palm.*

S. lævis, *Jack*, in *Comp. Bot. Mag.* i. 266; S. inermis, *Roxb.*

(Sago; Fæcula caudicis, *Offic.*)

Botany. *Gen. Char.*—Vide supra.

Sp. Char.—Arboreous, unarmed. *Embryo* lodged in or near the apex of the seed. *Leaves* pinnate. (*Roxburgh.*)

Hab. — Sumatra, Borneo, and the islands between them. Grows spontaneously in low swampy lands.

Sague'rus Rum'phii, Roxb.—*Rumphius's Wine Sago-Palm.*

Palma Indica vinaria secunda, Saguerus, sive Gomutus Gommuto, *Rumph.*
Sex. Syst. Monœcia, Polyandria.
(Sago; Fæcula caudicis, *Offic.*)

Botany. *Gen. Char.—Male: Calyx* three-leaved. *Corolla* three-petalled. *Female: Calyx* five-leaved. *Corolla* three-petalled. *Ovarium* superior, three-celled; cells one-seeded, attached to the base of the axis. *Style* none. *Stigma* three-dentate. *Berry* three-celled, with a single seed in each cell. *Embryo* in the back of the albumen. (*Roxburgh.*)

Sp. Char.—The only species.

Hab.—Islands eastward to the Bay of Bengal.

Manufacture of Sago.—A farinaceous substance, called sago, is said to be obtained from two species of Cycas (*vide* Cycadaceæ). But the sago of English commerce is obtained from one or more palms. All the three just mentioned (viz. *Sagus Rumphii* and *lævis*, and *Saguerus Rumphii*) yield it. Dr. Roxburgh (*Fl. Indica*, iii. 623) says, the granulated sago met with in Europe is got from Sagus lævis. Marsden (*Hist. of Sumatra*), on the other hand, says the Sagus Rumphii yields the sago of the shops. The manufacture of sago varies somewhat in different localities. In the Moluccas it is procured as follows:—When the tree is sufficiently mature, it is cut down near the root, and the trunk subdivided into portions of six or seven feet long, each of which is split into two parts. From these the medullary matter is extracted, and, with an instrument of bamboo or hard wood, is reduced to powder, like sawdust. This is mixed with water, which is then strained by a sieve. The filtered liquor deposits the farina, which, after two or more edulcorations, is fit for use. This is *raw sago meal.* For exportation, the finest meal is mixed with water, and the paste rubbed into small grains of the size and form of coriander seeds. Within the last few years, the Chinese of Malacca have invented a process by which they refine sago so as to give it a fine pearly lustre. The quantity of sago afforded by the sago-palm is prodigious. Five and six hundred pounds is not an unusual produce for one tree (Crawfurd, *Hist. of the Indian Archipelago*, vol. i. 383 et seq. and vol. iii. 348).

Description of Sago.—Sago occurs in commerce in two states, pulverulent and granulated.

1. *Pulverulent Sago; Sago meal* (*Farina Sagu*).—This is rarely imported. It is a fine powder, resembling in several respects arrow-root. Its colour is whitish, with a buffy or reddish tint. Its odour is slight, but somewhat unpleasant and musty. Examined by the microscope the particles are found to be unbroken: they are somewhat larger than those of arrow-root, and perhaps rounder; the hilum of each is a mere line, straight or curved.

2. *Granulated Sago* (*Grana Sagu*).—Of this there are two kinds, *pearl* and *common sago.* *a. Pearl sago* (*Sagu perlatum*) occurs in small hard grains, not exceeding in size that of a pin's head, inodorous, and having little taste. They are whitish, but with a greater or less tint of brownish or reddish yellow, and are sometimes translucent. They swell up in cold water. Examined by the microscope, most of the particles are found to be ruptured: the hilum of each is large, oval, yellowish brown,

defined by a fine line. *b. Common* or *brown Sago* (*Sagu fuscum*) is met with in larger grains, the largest being nearly the size of the grains of pearl-barley. They are whitish or brownish white: the same grain usually being white on one part of its surface, brownish white on another, as if it had been partially scorched. Examined by the microscope, the particles are found unbroken: the hilum of each is oval or round, defined by a thick dark line, and having a minute central point.

COMMERCE.—The quantity of sago on which duty was paid in 1838 was 26,988 cwts. (*Trade List*). It is brought from Singapore, in bags, &c. The quantity imported into France, in 1834, was 41,312 lbs. (Planche *Journ. de Pharm.* xxiii. 116).

COMPOSITION.—Sago has not been analyzed; but its composition is presumed to be analogous to that of other starchy bodies (p. 598).

CHEMICAL CHARACTERISTICS.—Sago possesses the characteristics of ordinary starch. A cold decoction forms a blue compound (*iodide of starch*) with iodine. A filtered infusion (prepared with cold distilled water, of pulverulent sago, or of brown sago, undergoes no change of colour on the addition of a tincture of iodine. But a similar infusion of pearl sago becomes blue with iodine. This evidently depends on the latter having been submitted to some process by which the starch-globules have become broken. The cold infusion of brown sago is rendered milky by nitrate of silver, diacetate of lead, and protonitrate of mercury; but the cold infusions of pulverulent and of pearl sago are scarcely affected by these tests.

PHYSIOLOGICAL EFFECTS.—It is nutritive and easy of digestion, and is an important article of food in some parts of the East. "The Malay Sago Palm," says Dr. Roxburgh, "is the tree, the pith of which is the staff of life to the inhabitants of the Moluccas."

USES.—Sago puddings are occasionally brought to table. But the principal use of sago is to yield a light, nutritious, easily digestible, and non-irritating article of food, for the invalid, in febrile and inflammatory cases. For this purpose it should be boiled in water (in some cases milk is preferred), the solution strained, and flavoured with sugar and spices, or even with a little white wine, when the use of this is not contra-indicated.

Are'ca Cat'echu, Linn.—*Cat'echu Palm.*

Sex. Syst. Monœcia, Hexandria.

(Semen. Extractum seminis dictum *catechu*. Carbo seminis, *Offic.*)

HISTORY.—Areca nuts are not mentioned in the writings of the ancient Greeks and Romans. Avicenna speaks of them under the name of *fufel* (lib. ii. p. 306, Venet. 1564).

BOTANY. *GEN. CHAR.*—1. *Male: Calyx* three-parted. *Corolla*, three-petalled. 2. *Female: Calyx* three-leaved. *Corolla* three-petalled; *nectary* six-toothed. *Ovarium* superior, one-celled, one-seeded; attachment inferior. *Drupe* coriaceous. *Seed* single, ruminate. *Embryo* in the base of the albumen. (*Roxburgh.*)

SP. CHAR.—Trunk straight and slender, from forty to fifty feet high. *Fronds* pinnate; *leaflets* compound, linear, opposite, præmorse. *Spathe* erect, ramous. *Male flowers* hexandrous. *Seed* of a roundish conic form and obtuse. (*Roxburgh.*)

HAB.—Cultivated in all the warmer parts of Asia.

DESCRIPTION AND USES OF THE SEEDS.—The fruit of the Catechu palm is about the size and shape of a small egg, yellowish, and smooth. Within the fibrous pericarp is the seed (*Areca nut; Betel nut; Pinang nut*). This is about the size of a nutmeg, roundish-conical, flattened at the base, hard, horny, inodorous, externally reddish-brown, internally brown with whitish veins. The principal part of the seed is the ruminate albumen, at the base of which is the embryo (Roxburgh's *Plants of Coromandel*, pl. 75). According to Morin (*Journ. de Pharm.* viii. 449), these seeds are composed of *tannin* (principally), *gallic acid, glutin, red insoluble matter, fixed oil, gum, oxalate of lime, lignin*, &c. With lime and the leaves of *Piper Betel*, these nuts form the celebrated masticatory of the East, called *betel*. They are usually cut into four equal parts; one of which is rolled up with a little lime in the leaf of the Piper Betel, and the whole chewed. The mixture acts as a sialogogue, and tinges the saliva red. The Indians have an idea that by this means the teeth are fastened, the gums cleansed, and the mouth cooled. Peron (*Voyage aux Terres Australes*) was convinced that he preserved his health, during a long and difficult voyage, by the habitual use of the betel, while his companions who did not use it died mostly of dysentery. In this country, *areca-nut charcoal* is used as a tooth-powder. I know of no particular value it can have over ordinary charcoal, except, perhaps, that derived from its greater hardness.

Manufacture of Palm Catechu.—From the seeds is obtained an astringent extract, which constitutes two (or perhaps more) kinds of the substance called *catechu* in the shops. It is largely procured in Mysore, about Sirah, in the following manner:—"Areca nuts are taken as they come from the tree, and boiled for some hours in an iron vessel. They are then taken out, and the remaining water is inspissated by continued boiling. This process furnishes *Kassu*, or most astringent terra japonica, which is black, and mixed with paddy husks and other impurities. After the nuts are dried, they are put into a fresh quantity of water, boiled again; and this water being inspissated, like the former, yields the best or dearest kind of catechu, called *Coury*. It is yellowish brown, has an earthy fracture, and is free from the admixture of foreign bodies." (Dr. Heyne, *Tracts, Historical and Statistical, on India.*)

Properties of Palm Catechu.—None of the commercial extracts, called catechu, are distinguished by any name referring to the catechu palm; and the description hitherto given of palm catechu is too slight and vague to enable us to recognize it with certainty. (For an account of the varieties, properties, composition, effects, and uses of catechu, vide *Acacia Catechu*: also *Butea frondosa*, and *Nauclea Gambir*.)

Other medicinal, &c. palms.

Palm oil (Oleum Palmæ) is imported from the western coast of Africa, principally from Guinea, where it is procured by expression from the fruit of the *Elais guineensis* (fig. 109). It has a solid consistence, a rich orange yellow colour, a sweetish taste, and an agreeable odour, somewhat similar to that of the rhizome of the Florentine orris. By exposure to light it is bleached. It consists of *Stearin* 31, and *Olein* 69, besides *colouring* and *odorous matters*. The Africans use it as butter. It is emollient and demulcent, like the other fixed oils, but is rarely employed in medicine. By the public it is occasionally employed by way of friction in bruises, sprains, &c. It is a constituent of the common black bougie. Its ordinary use in this country is in the manufacture of yellow soap. *Oleum fixum Coci butyraceæ ex nucibus*, Ph. Ed. also called *palm oil*, is analogous to the preceding in its properties. It is procured from the fruit of the *Cocos butyracea*, a native of South America, but I cannot find that any of it has been imported for some years past. *Cocoa-nut oil* is obtained by pressure, or by boiling, from the seed of *Cocos nucifera* (fig. 106). It is imported from Ceylon (Bennett, *The Coco-nut Palm, its Uses and Cultivation,* 2d ed. 1836).

Fig. 109.

Elais guineensis.

Fig. 110.

Ceroxylon Andicola.

The *wax palm of the Andes* (*Ceroxylon Andicola,* fig. 110) grows to the height of 160 or 180 feet. The stem shows, in its whole length, rings resulting from the fall of the leaves: the spaces between these are covered with a mixture of wax and resin, which the inhabitants use for the manufacture of candles. From the resin, Bonastre has extracted a substance which he calls *ceroxyline.*

Dates, obtained from the *Phœnix dactylifera,* form an important article of food in some parts of the world.

The term *Dragon's blood* (*Sanguis Draconis*) is applied in commerce to certain resinous substances which are mostly obtained from some palms of the genus *Calamus.* But the term is also applied to a product of the *Dracæna Draco* [vide Liliaceæ], as also to a substance obtained from the *Pterocarpus Draco* [vide Leguminosæ]. Lieut. Wellstead says, that in Socotra, Dragon's blood exudes spontaneously from the stem of a tree (*Athenæum,* May 16, 1835; also *Journ. of Royal Geographical Society*). Although Dragon's blood is now never used in medicine, yet as the *Resina Pterocarpi Draconis* is still retained in the Edinburgh Pharmacopœia, a short notice of this substance must be given. The following are the kinds of Dragon's blood which I have met with:—

1st. *Dragon's blood in the reed; Dragon's blood in sticks; Sanguis Draconis in baculis.* This occurs in dark reddish brown sticks, of from twelve to eighteen inches long and from a quarter to half an inch in diameter, enveloped with the leaf of the Talipat palm (*Corypha umbraculifera*), and bound round with slender slips of cane (probably the stem of *Calamus petræus*). It is supposed to be obtained from a species of *Calamus,* perhaps *C. Draco.*

2dly. *Dragon's blood in oval masses; Dragon's blood in drops; Sanguis Draconis in lachrymis,* Martius.—This occurs in reddish brown lumps of the size and shape of an olive, enveloped with the leaf of *Corypha umbraculifera* or *Corypha Licuala,* which thus connects them together in a row, like the beads of a necklace. This kind is rare in English commerce. It is obtained, according to Rumphius, by rubbing or shaking the fruit of *Calamus Draco* in a bag. A resinous exudation is by this means separated, and is afterwards softened by heat, and made up in these masses.

3dly. *Dragon's blood in powder.*—This is a reddish powder of very fine quality, imported from the East Indies. It is probably the dust obtained from the fruit of the *C. Draco.* in the way just described.

4thly. *Dragon's blood in the tear. Sanguis Draconis in granis,* Martius.—It occurs in irregular pieces, not exceeding the size of a horsebean. T. W. C. Martius (*Pharmakognosis*) says, pieces of the fruit of the Calamus Rotang are frequently found intermixed.

5thly. *Lump Dragon's blood. Sanguis Draconis in massis.*—This is of inferior quality. It occurs in large masses, which, when broken, present a heterogeneous appearance.

Other varieties of Dragon's blood are described, but I have never met with them.

Dragon's blood is composed of *red resin* (called *draconin*), 90·7; *fixed oil*, 2·0; *benzoic acid*, 3·0; *oxalate of lime*, 1·6; *phosphate of lime*, 3·7 (Herberger, *Journ. Pharm.* xvii. 225).

It is inert, or nearly so, but was formerly reputed an astringent. It is a constituent of some tooth-powders and tinctures, but is never prescribed by medical practitioners. Its principal consumption is for colouring spirit and turpentine varnishes.

Order 11. Melantha'ceæ, *R. Brown.*—The Colchicum Tribe.

Essential Character.—*Perianth* inferior, petaloid, in six pieces, or, in consequence of the cohesion of the claws, tubular; the pieces generally involute in æstivation. *Stamens* six; *anthers* mostly turned outwards. *Ovary* three-celled, many seeded; *style* trifid or three-parted; *stigma* undivided. *Capsule* generally divisible into three pieces; sometimes with a loculicidal dehiscence. *Seeds* with a membranous testa; *albumen* dense, fleshy. (*R. Brown.*)

Properties.—Poisonous: operation acro-narcotic. This is well shewn in the genera *Colchicum*, *Veratrum*, and *Asagræa*. MM. Pelletier and Caventou extracted what they considered to be *veratria* from each of these genera. According to Hesse and Geiger the active principle procured from Colchicum is *Colchicina*.

Col'chicum autumna'le, Linn. L. E. D.—*The Common Meadow Saffron.*

Sex. Syst. Hexandria, Trigynia.

(Cormus et semina, *L.* Bulbus et semina, *D.* Radix, *E.*)

History.—Dioscorides (*lib.* iv. *cap.* 84) speaks of *Colchicum* (κολχικόν), and says it grows in Messenia and at Colchis. From the latter place it received its name. Dr. Sibthorp (*Prodr. Fl. Græcæ*, i. 250) found three species of Colchicum in Greece, viz. *C. autumnale*, *C. montanum*, and *C. variegatum*. The first of these he considers to be the Colchicum of Dioscorides.

Botany. *Gen Char.*—*Perianth* single, tubular, very long, rising from a spatha; limb campanulate, six-partite, petaloid. [*Stamens* six, inserted into the throat of the tube. *Ovarium* three-celled. *Styles*, three, filiform, long. *Stigmas* somewhat clavate.] *Capsule* three-celled; cells united at the base. (*Hooker*, with some additions.)

Fig. 111.

Colchicum autumnale.

a, The flowering plant.
b, Stigmas, with a portion of the styles.
c, Leaves and fruit.

Sp. Char.—*Leaves* plane, broadly lanceolate, erect (*Hooker*).

Root fibrous. *Cormus* (improperly called *root* or *bulb*) ovate, fleshy, large, covered with a loose brown membrane. The *leaves* are produced in the spring along with the fruit, and disappear before the flower appears. *Flowers* several, lilac or pale purple, arising from the cormus by a long, narrow, white tube. *Fruit* oblong, elliptical, composed of three cells, which may be regarded as distinct capsules, with intermediate fissures. *Seeds* small, spherical, with a rough dark brown testa, and large fleshy strophiola; internally they are white, and consist of a minute embryo lodged in a horny elastic albumen. The flowers appear in September, and the fruit the following spring or summer.

Hab.—Moist rich meadows in many parts of England and in various countries of Europe.

Collection.—The activity of the *cormus* varies at different seasons of the year. It is greatest about the months of July and August, that is between the withering of the leaves and the sprouting forth of the flower. At this period the new cormus is fully developed, and has not exhausted itself by the production of the flower. But many of the cormi brought to market have already pushed forth their flowers, which are broken off so as to prevent the circumstance from being observed. "I have seen many *cwts.*" says Dr. Lindley (*Flora Medica*, p. 589), "sent to town in this state, which nevertheless found a ready sale, and at the best price." The *seeds* should be gathered when fully ripe. The London market is principally supplied from Gloucestershire, but partly also from Hampshire and Oxfordshire.

DESCRIPTION.—The *cormus*, L. (*bulbus*, D.; *radix*, E.; *radix recens*, Offic.), when gathered at the proper season, is about the size of a chestnut, and somewhat resembles in external appearance the cormus of the common tulip (*Tulipa Gesneriana*). It is rounded on one side, flattened on the other, where is perceived the fibrous germ of a new cormus, which, if allowed to grow, shoots up and bears the flower, while the old cormus wastes, becomes insipid, and inert. It is covered by two coats, an inner reddish-yellow one and an external brown one. Internally, the cormus is white, fleshy, solid, contains a milky juice, is very feculent, and has an acrid bitter taste. "Before drying the cormus, it should be cut transversely in thin slices, the dry coats being previously removed" (*Ph. Lond.*) The slices are to be quickly dried, in a dark airy place, with a heat not exceeding 170° F. (Battley, *Lond. Med. Rep.* xiv. 429). Dr. A. T. Thomson (*ditto*, p. 344) recommends the slices to be dried upon clean white paper, *without artificial heat*, but the time required for this is an objection to it in practice. The dried slices (*radix siccata*, Offic.) should be about the eighth or tenth of an inch thick, rounded, oval, or with one notch only on one part of their circumference (not fiddle-shaped), inodorous, of a greyish-white colour, and an amylaceous appearance.

The *seeds* (*semina*, L. D.) are about the size of those of white mustard, odourless, and have a bitter acrid taste. Their other qualities have been described above.

COMPOSITION.—The Colchicum cormus was analyzed in 1810 by Melandri and Moretti (*Bull. de Pharm.* vol. ii. p. 217), in 1818 by Stoltze (Thomson's *Org. Chem.* 846), and in 1820 by Pelletier and Caventou (*Journ. de Pharm.* vi. 364).

Analysis by Pelletier & Caventou.

Fatty matter composed of { Olein. Stearin. Volatile acid.
Supergallate of *veratria*.
Yellow colouring matter.
Gum.
Starch.
Inulin in abundance.
Lignin.
Ashes, a minute quantity.
Colchicum cormus.

Stoltze's Analyses.

	Cormi gathered in March.	Ditto in October.
Volatile acrid matter	trace	rather more
Soft resin	0·04	0·06
Crystallizable sugar	0·41	1·12
Uncrystallizable sugar	5·91	2·72
Bitter extractive		2·17
Difficultly soluble extractive	1·30	0·52
Gum, like tragacanth	0·81	1·65
Starch	7·46	10·12
Lignin	2·32	1·61
Extractive soluble in potash	0·61	0·52
Water	81·04	80·31
Colchicum cormus	99·90	100·80

Veratria will be described presently (vide *Asagræa officinalis*). The existence in colchicum seeds of a new principle, called *colchicina*, *colchicia*, or *colchicine*, has been announced by Geiger and Hesse (*Journ. de Chim. Méd.* x. 465). It was *prepared* by digesting colchicum seeds in boiling alcohol: this dissolved a supersalt, which was precipitated by magnesia, and the precipitate treated with boiling alcohol. By evaporation, colchicina was deposited. The following are said to be its *properties*:—It is a crystallizable alkaline substance, without odour, but having a bitter taste. Its hydrate is feebly alkaline, but neutralizes acids, and forms crystallizable salts, having a bitter taste. It is soluble in water, and the solution precipitates the solution of chloride of platinum. Nitric acid colours colchicina deep violet, which passes into indigo blue, and quickly becomes first green and then yellow. Concentrated sulphuric acid colours it yellowish brown.

Colchicina is distinguished from veratria by the following characteristics:—1st, it is soluble in water, whereas veratria is not; 2dly, it is crystallizable, whereas pure veratria is not; 3dly, it does not possess the acridity of veratria, and it differs from the latter in this, that when applied to the nose it does not excite sneezing, whereas the least portion of veratria occasions a most convulsive sneezing.

Colchicina is a powerful poison. One-tenth of a grain, dissolved in weak spirit, killed a young cat in about twelve hours. The symptoms were salivation, diarrhœa, vomiting, a staggering gait, cries, convulsions, and death. The stomach and intestines were violently inflamed, and had extravasated blood throughout their whole course.

The above statements require confirmation.

Chemical Characteristics.—A cold decoction of the fresh cormi forms a deep blue precipitate (*iodide of starch*) with a solution of iodine. Sesquichloride of iron communicates a faint bluish tint (*gallate of iron*) to the decoction. Acetate and diacetate of lead, and protonitrate of mercury, form white precipitates with the cold decoction. Nitrate of silver produces a precipitate which is at first white, but becomes in a few minutes black. Tincture of nutgalls produces a slight dirty-looking precipitate, which is somewhat diminished by the effect of heat. Pelletier and Caventou (*Journ. de Pharm.* vi. 365) regard this precipitate as a mixture of the *tannates of starch* and *inulin* (and of veratrin?). When heated to 122° F. the tannate of starch dissolves, but not that of inulin. Fresh prepared tincture of guaiacum with a few drops of acetic acid, produces a cerulean blue colour with the fresh cormus, indicating the presence of gluten.

Physiological Effects. (*a.*) *On vegetables.*—Not yet determined.

(*b.*) *On animals.*—Colchicum is a poison to animals. It acts as a local irritant, reduces the force of the circulation, and causes inflammation of the alimentary canal. Animals, for the most part, refuse to feed on it. It has, however, been eaten by deer and cattle, and proved poisonous to them (Wibmer, *Wirk. d. Arzn. u. Gifte*, Bd. ii. 150). It is said to prove injurious at spring-time only (Hacquet, in Wibmer, *op. cit.*; also, Want, *Lond. Med. and Phys. Journ.* vol. xxxii. p. 216). Moreover, we are told that when dried it may be eaten in hay with impunity. Störck (*Lib. de Colchico*, p. 17) and Kratochwill (quoted by Wibmer) gave it to dogs, on whom it acted as an acrid poison, and caused death. Sir E. Home (*Phil. Trans.* 1816) injected 160 drops of a vinous infusion of colchicum into the jugular vein of a dog: all power of motion was instantly lost, the breathing became slow, the pulse hardly to be felt. In ten minutes it was 84, in twenty minutes 60, in an hour 115, with the respiration so quick as hardly to be counted. In two hours the pulse was 150, and very weak. The animal was purged, vomited, and very languid: he died in five hours. On dissection, the internal coat of the stomach was found inflamed, in a greater or less degree, universally.

From this experiment it appears that the action of colchicum on the alimentary canal is of a specific kind.

In opposition to the above statements it deserves notice that Orfila (*Toxicol. Gén.*) has frequently given to dogs, in the month of June, two or three cormi without perceiving any sensible effects; from which he infers, that climate and season of the year have great influence on their deleterious properties.

It is said in several works that horses eat colchicum with impunity; but it is probable that this statement is erroneous. Withering (*Brit. Plants*, ii. 462, 7th ed. 1830) states, on the authority of Mr. Woodward, that "in a pasture in which were several horses, and eaten down nearly bare, the grass was closely cropped, even under the leaves, but not a leaf bitten."

Some further information on the effects of colchicum on dogs will be found in Sir C. Scudamore's *Treatise on Gout and Rheumatism*, 3d ed. p. 477, 1819.

(*c.*) *On man.—In small and repeated doses* colchicum has a tendency to promote the action of the secreting organs, especially of the intestinal mucous membrane. The kidneys, the skin, and the liver, are less certainly and obviously affected by it. The most constant effects observed from the use of *larger doses* are nausea, vomiting, and purging. Reduction of the frequency of the pulse is a common, though not an invariable effect. Mr. Haden (*Pract. Observ. on the Colchicum Autumnale*, 1820) was, I believe, the first to direct attention to the advantages to be taken of this effect in the treatment of inflammatory diseases. In some experiments made on healthy individuals by Dr. Lewins (*Ed. Med. and Surg. Journ.* vol. xlvii. p. 345, 1837), debility, a feeling of illness, and headache, were experienced. This feeling of debility is not, however, to be referred to the evacuations produced, for, as Dr. Barlow (*Cyclop. of Pract. Med.* art. *Gout*, vol. ii. p. 371) has observed, the number of motions is sometimes considerable without any proportionate depression of strength ensuing. "I have known," says Dr. B. "even twenty stools occasioned by a single dose of colchicum, the patient not complaining of the least debility." The action of colchicum on the secretory apparatus is not confined to that of the alimentary canal: after the use of three or four full doses of this medicine copious sweating is often produced, especially when the skin is kept warm. On other occasions the kidneys are powerfully acted on. In one case, mentioned by Dr. Lewins, seventy drops of *Vinum Colchici* caused the discharge of upwards of a pint of bile by vomiting. Violent salivation resulted in a case recorded in an American journal (Wood and Bache's *United States Dispensatory*, 3d ed.) Chelius, of Heidelberg (*Lond. Med. Gaz.* vol. ii. p. 830), asserts, that in gout and rheumatism colchicum occasions a striking increase in the quantity of uric acid contained in the urine: in one case it was nearly doubled in the space of twelve days. But this effect is by no means constant, as Dr. Graves (*Lond. Med. Gaz.* vol. vii. p. 584) has pointed out. Indeed, it not unfrequently happens, in acute rheumatism, when the urine is loaded with uric acid or the urates, that the use of colchicum diminishes the quantity of these matters in the urine; so that it would seem rather to prevent the formation of uric acid in the system than to provoke its elimination.

Under some circumstances colchicum acts as an anodyne: thus in gouty and rheumatic cases it sometimes speedily relieves the pain in a most surprising manner.

In excessive or *poisonous doses* colchicum acts as a powerful poison. In a case related by Mr. Fereday (*Lond. Med. Gaz.* vol. x. p. 160), where two ounces of the wine of the seeds of colchicum were swallowed, the symptoms were acute pain in the bowels, coming on in about an hour and a half after taking it, vomiting, acute tenesmus, small, slow, and feeble pulse, cold feet, and weakness of limbs. The nausea, vomiting, and pain in the stomach, continued with undiminished violence, the pulse became also imperceptible and intermitting, the urine was suppressed, the respiration hurried, purging of copious liquid stools came on, and loss of sight for a minute or two after getting out of bed. The patient died forty-seven hours after swallowing the poison. On a *post-mortem* examination, the skin of most parts of the body was found to be covered with a purple efflorescence; no inflammation was observed in the alimentary canal; two red patches were found, one in the stomach, and the other in the jejunum. These were produced by the effusion of a small quantity of blood, in the one case, between the muscular and mucous coats; in the other, between the peritoneal and muscular coats. Ecchymosed spots were observed on the surface of the lungs, of the heart, and of the diaphragm.

In this instance the only indications of an affection of the nervous system were weakness of the limbs, the temporary loss of sight, and the slowness and feebleness of the pulse.

It is deserving of notice, that in this case, also in another case related by Chevallier (*Journ. de Chim. Méd.* viii. 351), likewise in a third case mentioned by Mr. Dillon (Stephenson and Churchill's *Med. Bot.* vol. ii.), and in Mr. Haden's case (*Magendie's Formulary*, by C. T. Haden), no convulsions were observed; and in the three first cases no insensibility. In the last case, however, Mr. Haden mentions that at "ten *p. m.* she fell into an apoplectic kind of sleep, which terminated in death before morning." It is remarkable that convulsions are ascribed to veratria by Magendie, and to colchicina by Geiger and Hesse. In one case of fatal poisoning from an ounce and a half of the tincture of colchicum (*Ed. Med. and Surg. Journ.* xiv. 262) delirium occurred.

The above account of the effects of colchicum applies both to the *cormi* and the *seeds.* The *flowers* are likewise poisonous, and a fatal case from their use is mentioned by Dr. Christison (*Treat. on Poisons*, 3d ed. p. 792). They have been recommended for medicinal use.

Uses.—The following are the principal diseases in which the Meadow Saffron has been employed:—

1. *In Gout.*—The circumstances which of late years have led to the extensive employment of colchicum in gout are the following:—About seventy years ago, M. Husson, a military officer in the service of the king of France, discovered, as he informs us, a plant possessed of extraordinary virtues in the cure of various diseases. From this plant he prepared a remedy called *Eau Médicinale*, which acquired great celebrity for abating the pain and cutting short the paroxysm of gout (Dr. E. G. Jones, *An Account of the Remark. Effects of the Eau Médicinale d'Husson in the Gout*). Various attempts were made to discover the nature of its active principle. In 1782, MM. Cadet and Parmentier declared that it contained no metallic or mineral substance, and that it was a vinous infusion

of some bitter plant or plants. Alyon (*Elém. de Chimie*) asserted that it was prepared with Gratiola; Mr. Moore (*Two Letters on the Composition of the Eau Médicinale*, 2d ed. 1811) that it was a vinous infusion of white hellebore with laudanum; Mr. Want (*Med. and Phys. Journ.* vol. xxxii. 1814) that it was a vinous infusion of Colchicum. Although most writers have adopted Mr. Want's opinion, we should bear in mind that the proofs hitherto offered of its correctness, viz. analogy of effect, cannot be admitted to be conclusive, as is well shewn by the fact, that they have been advanced in favour of the identity of other medicines with the *Eau Médicinale.*

The power of Colchicum to alleviate a paroxysm of gout is admitted by all; but considerable difference of opinion exists as to the extent of this power, and the propriety of employing it. Sir Everard Home (*Phil. Trans.* 1816) from observation of its effects on his own person, regarded it as a specific in gout, and from experiments on animals concluded that its beneficial effects in this malady are produced through the circulation. Dr. Paris (*Pharmacologia*, vol. ii. p. 175, ed. 6th) observes—"As a *specific* in gout its efficacy has been fully ascertained: it allays pain, and cuts short the paroxysm. It has also a decided action upon the arterial system, which it would appear to control through the medium of the nerves." But if by the term specific is meant a medicine infallibly, and on all patients, producing given salutary effects, and acting by some unknown power on the disease, without being directed by indications (vide Dr. Parr's *Lond. Med. Dict.* art. *Specifica*), undoubtedly Colchicum is no specific for gout.

That Colchicum alleviates a paroxysm of gout I have before mentioned; but that alleviation is palliative, not curative. It has no tendency to prevent a speedy recurrence of the attack; nay, according to Sir Charles Scudamore (*Treat. on Gout and Rheumatism*, 3d ed. p. 197), it renders the disposition to the disease much stronger in the system. Furthermore, by repetition its power over gouty paroxysms becomes diminished.

The *modus medendi* of Colchicum in gout is an interesting though not very satisfactory part of our inquiry. I have already stated that some regard this remedy as a specific, that is, as operating by some unknown influence. Others, however, and with more propriety, refer its therapeutical uses to its known physiological effects. "Colchicum," says Dr. Barlow (*Cyclop. of Med.* art. *Gout*, vol. ii. p. 372), "purges, abates pain, and lowers the pulse. These effects are accounted for by assigning to it a cathartic and sedative operation, and it is this combination perhaps to which its peculiar virtues are to be ascribed." The fact that a combination of a drastic and a narcotic (as elaterium and opium, mentioned by Dr. Sutton in his *Tracts on Gout*, p. 201; and white hellebore and laudanum, recommended by Mr. Moore, *op. cit.*) has been found to give, in several cases of gout, marked and speedy relief, seems to me to confirm Dr. Barlow's opinion. The idea entertained by Chelius, and adopted by Dr. G. Hume Weatherhead (*Treat. on Headachs*, p. 88, 1835), that colchicum relieves gout by augmenting the quantity of uric acid in the urine, is not supported by fact, as I have already mentioned. Whether it acts by preventing the formation of uric acid in the system I am not prepared to say.

In acute gout occurring in plethoric habits, blood-letting should precede the use of Colchicum. This medicine should then be exhibited in full doses, so as to produce a copious evacuation of the bowels, and then the quantity must be considerably diminished. Though purging is not essential to the therapeutical influence of Colchicum, it is admitted by most that, in a large number of cases at least, it promotes the alleviation of the symptoms. Hence, many practitioners recommend its combination with saline purgatives, as the sulphate of magnesia. Sir Charles Scudamore has experienced "the most remarkable success from a draught composed of *Magnesiæ*, gr. xv. ad xx.; *Magnes. Sulphat.* ʒj. ad ʒij.; *Aceti Colchici*, ʒj. ad ʒij.; with any distilled water the most agreeable, and sweetened with any pleasant syrup, or with 15 or 20 grains of Extract. Glycyrrhiz."

2. *In Rheumatism.*—The analogy existing between gout and rheumatism has led to the trial of the same remedies in both diseases. As far as my own observations have gone, I cannot say much in praise of Colchicum as a remedy for rheumatism. Indeed, though I have employed it extensively in both the acute and chronic forms of the disease, I have never been fully satisfied that much benefit resulted therefrom. Rheumatism may affect the fibrous tissues of the joints, the synovial membrane, the muscles or their aponeuritic coverings, the periosteum, or the neurilema, constituting thus five forms of the disease, which may be denominated respectively the *fibrous*, or *ligamentous*; the *synovial*, *arthritic*, or *capsular*; the *muscular*; the *periosteal*; and the *neuralgic* forms of rheumatism (Dr. Macleod, *Lond. Med. Gaz.* xxi. 120). Of these colchicum is said to produce its best effects in the synovial form. It is remarkable, however, that in all the severe cases of this variety of rheumatism which have fallen under my notice, the disease has proceeded unchecked, or was scarcely relieved by the use of colchicum. In one instance, that of my much-lamented friend, the late Dr. Cummin (whose case is noticed by Dr. Macleod, in the *Lond. Med. Gaz.* xxi. 358), the disease proved fatal by metastasis to the brain. In another melancholy but not fatal case, the gentleman has lost the sight of both his eyes, and has both knee-joints rendered stiff. In neither of these cases was colchicum of the slightest avail.

Of the mode of administering colchicum in "rheumatic gout," recommended by Mr. Wigan (*Lond. Med. Gaz.* June 30, 1838), I have no experience. He gives eight grains of the powder in some mild diluent every hour until active vomiting, profuse purging, or abundant perspiration, take place; or at least till the stomach can bear no more. The usual quantity is eight or ten doses; but while some take fourteen, others can bear only five. Though the pain ceases, the more active effects of the colchicum do not take place for some hours after the last dose. Thus administered, Mr. Wigan declares colchicum "the most easily managed, the most universally applicable, the safest, and the most certain specific, in the whole compass of our opulent Pharmacopœia." But its use in these large doses requires to be carefully watched.

3. *In Dropsy.*—Colchicum was used in dropsy with success by Störck (*Libellus*). It has been employed in dropsical cases with the two-fold view of purging and promoting the action of the kidneys. Given in combination with saline purgatives, I have found it beneficial in some cases of anasarca of old persons.

4. *In inflammatory diseases generally.*—Colchicum was recommended as a sedative in inflammatory diseases in general by the late Mr. C. T.

Haden (*Pract. Observ. on the Colchicum autumnale*, 1820). He used it as an auxiliary to blood-letting for the purpose of controlling arterial action; and gave it in the form of powder, in doses of six or seven grains, three or four times daily, in combination with purgatives, in inflammatory affections of the lungs and their membranes, and of the breasts and nipples. In chronic bronchitis it has also been found useful by Dr. Hastings (*Treat. on Inflammation of the Mucous Membrane of the Lungs*, 1820).

5. *In fevers.*—The late Mr. Haden (*op. cit.*), and more recently Dr. Lewin (*Ed. Med. and Surg. Journ.* April 1837), have spoken favourably of the use of colchicum in fever. In my opinion it is only admissible in those forms of the disease requiring an active antiphlogistic treatment. In such it may be useful as an auxiliary to blood-letting and cathartics.

6. *In various other diseases.—For expelling tape-worm*, colchicum has been found efficacious by Chisholm and Baumbach. *In some chronic affections of the nervous system*, as chorea, hypochondriasis, hysteria, &c. Mr. Raven (*Lond. Med. and Phys. Journ.* Jan. 1817) employed it with advantage. *In humoral asthma, and other chronic bronchial affections*, I have found it of great service, especially when these complaints were accompanied with anasarcous swellings.

ADMINISTRATION.—The cormi and seeds of meadow saffron have been employed in substance, in a liquid form, and in the state of extract.

1. *PULVIS CORMI COLCHICI.*—Dose from two to eight or nine grains. To preserve it, Mr. Wigan recommends it to be kept mixed with sugar.

2. *PULVIS SEMINUM COLCHICI.*—Dose the same as that of the cormus. The seeds are to be preferred to the cormi, as being more uniform in their properties.

3. *TINCTURA* [*SEMINUM*] *COLCHICI*, Lond. Ed.; *Tinctura seminum Colchici*, Dubl.—Meadow Saffron seeds bruised [ground finely in a coffee-mill, *Ed.*], ℥v. (℥ij. Dub.); Proof Spirit, Oij. (Oj. *wine measure*, Dub.) Macerate for fourteen days, and strain, L. "Percolation is much more convenient and speedy than digestion," *Ed.** Dr. Williams (*Lond. Med. Rep.* vol. xiv. p. 93) objected to this preparation as being "turbid, unpalatable, and disposed to precipitation." The same

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* The following remarks on *percolation*, as applied to the preparation of tinctures, are extracted from *The Pharmacopœia of the Royal College of Physicians of Edinburgh*, 1839, a copy of which I received after the present sheet was in type:—

"A much superior method, however, has been lately introduced, which answers well for most tinctures, namely, the method of displacement by percolation. According to this process, the solid materials, usually in coarse or moderately fine powder, are moistened with a sufficiency of the solvent to form a thick pulp; in twelve hours, or frequently without any delay, the mass is put into a cylinder of glass, porcelain, or tinned iron, open at both ends, but obstructed at the lower end by a piece of calico or linen, tied tightly over it as a filter; and the pulp being packed by pressure, varying as to degree, with various articles, the remainder of the solvent is poured into the upper part of the cylinder, and allowed gradually to percolate. In order to obtain the portion of the fluid which is kept in the residuum, an additional quantity of the solvent is poured into the cylinder until the tincture which has passed through equals in amount the spirit originally prescribed; and the spirit employed for this purpose is then recovered for the most part by pouring over the residuum as much water as there is of spirit retained in it, which may be easily known by an obvious calculation in each case. The method by percolation, where applicable, will be found much more convenient and writer (*op. cit.* vol. xv. p. 442) also asserts, that the active property of the seeds resides in their husk or cortical part, and, therefore, protests against bruising them. But were his assertion correct (and it is most improbable that the embryo is devoid of activity), bruising them cannot destroy or injure their activity. The average dose is from f℈ss. to f℈j. I have repeatedly given f℈ij. at a dose without any violent effect. Dr. Barlow, who prefers this to the other preparations of colchicum, advises that in gout a drachm, a drachm and a half, or two drachms of the tincture, should be given at night, and repeated the following morning. If this quantity fail to purge briskly, a third dose may be administered the ensuing night. Externally, the tincture has been employed as a liniment, to relieve rheumatic, gouty, venereal, and other pains. (Laycock, *Lond. Med. Gaz.* vol. xxiii. p. 899; and vol. xxiv. 388.)

4. *Tinctura* [*seminum*] *Colchici composita*, Lond.; *Spiritus Colchici ammoniatus*, L. 1824.—Meadow Saffron seeds, ℥v.; Aromatic Spirit of Ammonia, Oij. Macerate for fourteen days, and strain. Dose ♏xx. to f℈j. This preparation was recommended by Dr. Williams as being "of greater value when acidity or flatulence prevails, than the *Vin. sem. Colchici*, and better adapted to the palates of those who object to the flavour of white wine." It is seldom employed. Mr. Brande (*Dict. of Mat. Med.* 1839) says, doubts are entertained as to the propriety of employing ammonia in it.

5. *Vinum seminum Colchici.*—No formula for this exists in any of the British pharmacopœias. The following is Dr. Williams's formula:—Meadow Saffron seeds, dried, ℥ij.; Sherry wine, Oj. (*wine measure*). Macerate for eight or ten [fourteen] days, occasionally agitating, then filter. The average dose is f℈ss. to f℈j. I have given it to the extent of f℈ij. Dr. Williams says it may be gradually increased to f℈iij.

6. *Vinum* [*cormi*] *Colchici*, Lond. Ed.—Dried Meadow Saffron cormus, sliced, ℥viij.; Sherry Wine, Oij. Macerate for fourteen [seven, Ed.] days, [express strongly the residuum, Ed.] and strain. Average dose, f℈ss. to f℈j. Sir E. Home (*Phil. Trans.* 1817) thought that the second and subsequent deposits which take place from this wine, contain the principle which acts on the stomach and bowels, while that which cures the gout is retained in permanent solution. But Sir C. Scudamore (*Treat. on Gout.* 3d ed. p. 513) found the sediment to be inert.

7. *Acetum* [*cormi*] *Colchici*, Lond. Dub. Ed.—Fresh Meadow Saffron cormus, sliced, ℥j.; Distilled Vinegar, f℥xvj.; Proof Spirit, f℥j. Macerate the meadow saffron cormus with the vinegar, in a covered glass vessel, for three days; afterwards press, and strain the liquor, and set it by, that the dregs may subside: lastly, add the spirit to the clear liquor. Though the Colleges order the *fresh* cormus to be used, druggists frequently prepare it with the *dried*, on account of the impossibility of pro-

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expeditious than the mode hitherto commonly followed, and it exhausts the solid materials in general much more completely. As considerable practice, however, is required for managing the details in different cases, more especially in regard to the degree of minuteness of division of the solids, and the degree of firmness with which they are to be packed in the cylinder, we have thought it right to direct that the method by maceration may be followed as an alternative; but the method by percolation is now preferred by all who have made sufficient trial of it to apply it correctly."

curing the fresh at all seasons of the year. Hence it is to be regretted that the Colleges have directed the latter to be employed, as it leads to variation in the mode of preparation. In practice, one part of the dried cormus may be considered equal to three parts of the fresh: for Mr. Battley (*Lond. Med. Gaz.* xij. 463) says the cormus loses about 67 per cent. of its weight in drying; and Mr. Bainbrigge (Haden, *Pract. Observ. on Colch. autumn.* p. 77) obtained 2 lbs. 15 oz. of dried slices from 8 lbs. of fresh cormi. The proof spirit used in preparing the acetum is for the purpose of checking decomposition. By the action of the acetic acid on the colchicina of the cormus, an acetate of this alkaloid is obtained. Sir C. Scudamore (*Observ. on the Use of Colchicum*) regards an acetic preparation of colchicum as milder than the wine or tincture made with the same relative weights of cormi and liquids, though it is a most efficient preparation in gout. He advises, as I have before mentioned, that it should be given in combination with magnesia, by which its acid menstruum is destroyed (acetate of magnesia being formed), and the active principle of the colchicum left in the most favourable state for administration. The average dose is from f℥ss. to f℥ij.

8. *Extractum* [*cormi*] *Colchici aceticum.* Lond. Ed.—Fresh Meadow Saffron cormus, lb. j; Acetic [pyroligneous, *Ed.*] acid, f℥iij. Bruise the cormus gradually sprinkled with the acetic acid, then press out the juice, and evaporate it in an earthen vessel which is not glazed with lead [over the vapour bath, *Ed.*], to a proper consistence. This compound contains the acetate of colchicina. It is a very favourite remedy in the treatment of gout and rheumatism, and was introduced into practice by Sir C. Scudamore. Dr. Paris (*Append. to the 8th ed. of the Pharmacologia*) observes, that he has "found it useful in promoting healthy discharges of bile." He occasionally combines it with blue pill, calomel, or potassio-tartrate of antimony. The dose is from gr. j. to gr. iij. twice or thrice a day.

9. *Extractum Colchici cormi*, Lond.—Fresh Meadow Saffron cormus, lb. j. Bruise the cormus, sprinkled with a little water, in a stone mortar; then press out the juice, and evaporate it, unstrained, to a proper consistence. This is a favourite preparation with Dr. Hue, of St. Bartholomew's Hospital, in the early stage of acute rheumatism. The dose is gr. j. every four hours.

10. *Oxymel* [*cormi*] *Colchici.* Dub.—Fresh Cormus of Meadow Saffron, cut into thin slices, ℥j.; Distilled Vinegar, Oj. (*wine measure*); Clarified Honey, *by weight*, lb. ij. Macerate the meadow saffron with the vinegar in a glass vessel for two days: to the liquor, strongly expressed from the cormus and filtered, add the honey, and then boil down the mixture to the consistence of a syrup, frequently stirring it with a wooden rod. The active principle of this preparation is apt to be injured by boiling, and hence its strength is uncertain. It is used in gout, rheumatism, dropsy, and humoral asthma. The dose is ʒj. gradually increased to ʒij. or more, twice in the day.

Antidote.—See Veratrum album.

Hermodac'tylus, Auct.—*Hermodac'tyl.*

History.—Among the later Greek and the Arabian physicians, a medicine called hermodactyl (ἑρμοδάκτυλος, from Ἑρμῆς, *Mercury* or *Hermes*, and δάκτυλος, *a finger*) was in great repute as a remedy for arthritic diseases. It was first mentioned by Alexander of Tralles (lib. xi), who flourished A.D. 560. Paulus of Egina (*Opera*, lib. iii. cap. 78), who lived A.D. 650, Avicenna (lib. ii. cap. 352), Serapion (*De simplicibus*, cap. 194), and Mesue (*Opera*, p. 37, Ed. Bonon. 1484), also speak of it. It is deserving of especial notice, that under the name of *Surugen* or Hermodactyl, Serapion comprehends the κολχικόν and ἐφήμερον of Dioscorides and the ἑρμοδάκτυλος of Paulus.

Natural History.—The cormi brought from Oriental countries in modern times under the name of hermodactyls, answer to the descriptions given of the ancient substance bearing this name. I am, therefore, induced to believe them to be identical with the latter. Their resemblance to the cormi of Colchicum autumnale leads me to reject the notion of Matthiolus, at one time entertained by Linnæus (Murray, *App. Med.* vol. v. p. 215), and adopted by Martius (*Pharmakognosie*, 42), that they are produced by *Iris tuberosa.* That they are the underground stems of some species of Colchicum can scarcely, I think, be doubted by any one who carefully examines them. Notwithstanding the statements of Mr. Want (*Med. Phys. Journ.* vol. xxxii.) and of Sir H. Halford *(On the Treatment of Gout)*, I cannot admit hermodactyls to be the cormi of *Colchicum autumnale.* Though resembling the latter in several circumstances, they possess certain distinctive peculiarities. Some of the most eminent pharmacologists of Europe (*e. g.* Guibourt, Goebel, Geiger, Geoffroy, &c.) also regard them as distinct. The *Colchicum illyricum*, mentioned in many works as yielding hermodactyl, is unknown to modern botanists. The cormus of *Colchicum byzantinum* is too large to be confounded with hermodactyl. *Colchicum variegatum* has been supposed by several botanists and pharmacologists to be the source of hermodactyl, but further evidence is required to establish the opinion. This plant is a native of Sicily, Crete, Greece, and Portugal. Dr. Sibthorp (*Prod. Fl. Græcæ*, ii. 250) found it on Helicon, Parnassus, and other mountains of Greece. It is not improbable, I think, that *Colchicum bulbocodiodes* may yield hermodactyl, which Dale (*Pharmacologia*, p. 245, ed. 3[tia]) tells us, is brought from Syria. For Dr. Lindley informs me that this species of Colchicum was found by Col. Chesney near the Euphrates, where it was very common, flowering in March. The cormi were not brought over. Iris tuberosa was not found there. Forskäl (*Fl. Ægypt. Arab.* p. 77) found *Colchicum montanum* (which Sprengel, in his *Syst. Veg.* regards as identical with C. bulbocodiodes) at Kurma, in Arabia.

Description.—Mesue says that hermodactyl is either long, like the finger, or round. Of the round, he adds, there are three kinds, the white, the red, and the black, the white being the best. Through the kindness of my friend, Professor Royle, I have had the examination of two kinds of hermodactyl, procured by him in the bazars of Northern India, brought, he thinks, from Surat or Bombay, and probably imported there from the Red Sea.

1. *Tasteless Hermodactyl. Sorinjan sheeren* (i. e. sweet sorinjan), Royle. *Hermodactylus*, Auct. nostræ ætatis.—In their general form, these cormi resemble those of Colchicum autumnale. They are flattened, cordate, hollowed out or grooved on one side, convex on the other. At their lower part (forming the base of the heart) is a mark or disk for the insertion of the root fibres. Their size varies: the specimens I have examined were from $\frac{3}{4}$ to $1\frac{1}{2}$ inches in length or height, 1 to $1\frac{1}{2}$ inches in breadth, and about $\frac{1}{2}$ an inch in depth. They have been deprived of their coats, are externally dirty yellow or brownish, internally white, easily broken, farinaceous, opaque, odourless, tasteless or nearly so, and worm-eaten. They are readily distinguished from the cormi of Colchicum autumnale by the following characters, which are correctly stated by Geoffroy (*Trait. de Mat. Med.* t. ii. p. 79) :—They are not rugose, are white internally, are moderately hard, easily broken, and form a whitish powder; whereas the dried cormi of Colchicum autumnale are rugose, softer, and have a reddish or greyish tint both internally and externally.

2. *Bitter Hermodactyl. Sorinjan tulkh* (i. e. bitter sorinjan), Royle. ? *Bulbs of another Colchicum* (Goebel, *Pharm. Waarenk.* p. 271). ?? *Hermodactylus rubeus et niger* (Avicenna and Mesue). The cormi of this variety are distinguished from the preceding by their bitter taste, their smaller size, and by having externally a striped or reticulated appearance. Their colour for the most part is darker; in some specimens it is blackish. One cormus is ovate-cordate; 1 inch in height or length, $\frac{3}{4}$ of an inch broad, and about $\frac{1}{4}$ of an inch thick, grooved or hollowed on one side, convex on the other; of a brownish yellow colour, semi-transparent, has a horny appearance, and is marked by longitudinal

stripes, indicating a laminated structure. A second is opaque, amylaceous, reticulated externally, white internally, less flattened, and of a remarkable shape, the concave or hollow side of the cormus being continued half an inch below the mark for the attachment of the root fibres. The other cormi are of the size and shape of a large orange pip, but flattened or grooved on one side; some of them are worm-eaten, and one is blackish brown externally.

Composition.—Lecanu (*Journ. de Pharm.* xi. 350) analyzed hermodactyls (?the *tasteless* variety), and obtained the following results:—*Starch* (forming the principal constituent of the hermodactyl), *fatty matter*, *yellow colouring matter*, *gum*, *supermalates of lime* and *potash*, and *chloride of potassium*.

Is the absence of veratria or colchicina to be ascribed to the cormi having undergone decomposition by keeping? No inulin was detected.

Chemical Characteristics.—Both the *tasteless* and *bitter* hermodactyls are blackened by tincture of iodine, shewing the presence of starch. A cold decoction of the *bitter* variety produced an intense blue precipitate (*iodide of starch*) with a solution of iodine. Tincture of galls, and solutions of protonitrate of mercury, and of diacetate of lead, caused a cloudiness in the cold decoction.

Effects and Uses.—No modern experiments have been made to determine the activity of hermodactyl. The *tasteless* variety is probably inert, or nearly so; but the *bitter* variety, I suspect, possesses some activity. Is its operation analogous to that of the cormus of Colchicum autumnale?

Speaking of the treatment of gout and arthritis, Paulus says, "some, in the paroxysms of all arthritic diseases, have recourse to purging with hermodactylus; but it is to be remarked, that the hermodactylus is bad for the stomach, producing nausea and anorexia, and ought, therefore, to be used only in the case of those who are pressed by urgent business; for it removes rheumatism speedily, and after two days at most, so that they are enabled to resume their accustomed employment" (Adams's *Translation*, vol. i. p. 357).

Vera'trum al'bum, Linn. L. E. D.—*White Hel'lebore.*

Sex. Syst. Polygamia, Monœcia.

(Radix, *L. D.* Rhizoma, *E.*)

History.—This is, I think, the ἑλλέβορος λευκὸς of Dioscorides, and probably, therefore, of other ancient writers, as Hippocrates and Theophrastus. On this point, however, considerable difference of opinion has existed. Schulze (*Diss. inaug. sist. Toxicol. Veterum*, Halæ, 1788), while he acknowledges the great similitude between *Veratrum album*, Linn. and the white hellebore of Dioscorides, is of opinion that the true hellebore (both white and black) of Theophrastus is wholly lost. And Dr. Sibthorp (*Prod. Fl. Græcæ*, i. 439) regards *Digitalis ferruginea* as the white hellebore of Dioscorides, an opinion from which Sir J. Smith, the editor of the Prodromus, expresses his dissent. (For some interesting information respecting the ancient hellebore, consult Dierbach, *Arzneimittel d. Hippocrates*, p. 107.) The term *veratrum* is said by Lemery to be derived from *vere atrum* (*truly black*), in reference to the colour of the rhizome; but this etymology is improbable.

Botany. *Gen. Char.*—*Flowers* polygamous. *Perianth* six-parted; segments broad, concave, imbricating, nearly equal, striated, not excavated at the base. *Stamens* six, equal, inserted into the base of the segments; *filaments* subulate; *anthers* reniform, with confluent cells. *Ovary* with three divaricating *stigmas*. *Capsule* three-horned, separating into three many-seeded follicles. *Seeds* compressed, winged at the apex. (*Lindley.*)

Sp. Char.—*Panicle* decompound. *Bracts* equalling the flowers. *Pedicels* pubescent. *Segments of the perianth* somewhat erect and obtuse, serrulate. *Leaves* ovate-oblong, plaited. (*Sprengel.*)

Fig. 112.

Veratrum album, Linn. var. *albiflorum*.

Root composed of numerous fleshy, brownish-white fibres, arising from a perennial, cylindrical, fleshy, subterraneous stem or *rhizome*, which is brown externally, brownish-white internally, and is placed obliquely in the earth. *Stem* one to four feet high. The plant flowers from June to August.

Two varieties (by some considered distinct species) are included here:—

α. *albiflorum* (*V. album*, Bernh.) with decompound raceme and white flowers.

β. *viridiflorum* (*V. Lobelianum*, Bernh.) with compound raceme and greenish flowers.

Hab.—Mountainous regions of Europe. Abounds in the Alps and Pyrenees.

Description.—The *rhizome* (*radix veratri*, offic. *radix hellebori albi*) is single-, double- or many-headed, having the form of a cylinder, or, more frequently, of a truncated cone. It is from two to four inches long, and about one inch in diameter, rough, wrinkled, greyish or blackish-brown externally, whitish internally. Portions of the root fibres are usually attached to it, as well as some soft, fine, hair-like fibres. At the upper extremity of the rhizome we frequently observe the cut edges of numerous concentric, woody, or membranous scales: they are portions of the dried leaf-sheaths. When cut transversely, the rhizome presents a large central portion (frequently called *medulla*), which varies in its qualities, being woody, farinaceous, or spongy, in different specimens. This is separated by a brown fine undulating line from a thick woody ring, in which the root fibres take their origin. On the outside of this is a narrow but compact, brown, epidermoid coat. The odour of the dried rhizome is feeble; the taste is at first bitter, then acrid. By keeping, the rhizome is apt to become mouldy.

Composition.—White hellebore rhizome was analyzed in 1820 by MM. Pelletier and Caventou (*Journ. de Pharm.* vol. vi. p. 363), who obtained the following results:—*Fatty matter* (composed of *olein*, *stearin*, and a *volatile* [cevadic ?] *acid*), *supergallate of veratria*, *yellow colouring matter*, *starch*, *ligneous matter*, and *gum*. The ashes contained much *phosphate* and *carbonate of lime*, *carbonate of potash*, and some traces of *silica* and *sulphate of lime*, but no chlorides. They could not obtain the volatile [cevadic ?] acid in a crystalline form. [For an account of *veratria*, vide Asagræa officinalis.]

Simon (*Berl. Jahrb. für d. Pharm.* Bd. xxxviii. S. 393; also *Lond.* and *Ed. Phil. Mag.* vol. xii. p. 29) has discovered a new vegetable base in the rhizome of this plant, and has called it *Jervin*.

Chemical Characteristics.—A decoction of the rhizome underwent, on the addition of a solution of gelatin, no change, shewing the absence of tannic acid; but with the sesquichloride of iron, it became olive green (*gallate? of iron*). With tincture of galls it became slightly turbid (*tannates of veratria and starch*). With acetate and diacetate of lead, and protonitrate of mercury, it formed copious precipitates. The rhizome left after the decoction had been prepared from it, became, on the addition of a solution of iodine, black *(iodide of starch)*.

Physiological Effects. (*a.*) *On vegetables.*—Not ascertained.

(*b.*) *On animals generally.*—"The best account of its effects is contained in a thesis by Dr. Schabel, published at Tübingen, in 1817. Collecting together the experiments previously made by Wepfer, Courten, Viborg, and Orfila, and adding a number of excellent experiments of his own, he infers that it is poisonous to animals of all classes—horses, dogs, cats, rabbits, jackdaws, starlings, frogs, snails, and flies; that it acts in whatever way it is introduced into the system—by the stomach, rectum, windpipe, nostrils, pleural membrane of the chest, on external wounds, or the veins; that it produces in every instance symptoms of irritation in the alimentary canal, and injury of the nervous system; and that it is very active, three grains of the extract applied to the nostrils of a cat having killed it in sixteen hours" (Christison's *Treat. on Poisons*, 3d ed. p. 790).

(*c.*) *On man.*—Its *local* action is that of a powerful acrid. Applied to the Schneiderian membrane, it excites violent sneezing. Epistaxis even is said to have been induced by it. Its operation when swallowed, or placed in contact with the skin, is also that of an energetic irritant.

Its *remote* action is on the secretory apparatus, the stomach and intestines, and the nervous system. In *small* and *repeated doses* it promotes secretion from the mucous surfaces, the salivary glands, the kidneys, and the uterus, and increases the cutaneous exhalation (Greding, *Sämmtl. med. Schrift.* Th. 1, S. 179). In *larger doses* it causes vomiting, purging, pain in the abdomen, tenesmus, and occasionally bloody evacuations, and great prostration of strength. In some instances a few grains even have had these effects. Schabel says there is no substance which so certainly and promptly provokes vomiting; and Horn (*Archiv*, B. x. H. 1, S. 161) employed it as a sure emetic. In addition to the local action which it exercises, when swallowed, on the stomach and intestines, it possesses a specific power of influencing these viscera: for Etmuller (*Opera omnia*, tom. ii. pt. 2, p. 144) has seen violent vomiting result from the application of the rhizome to the abdomen; and Schröder (Orfila, *Toxicol. Gén.*) observed the same occurrence where the rhizome was used as a suppository. In *excessive doses* it operates as a narcotico-acrid poison, producing gastro-intestinal inflammation and an affection of the nervous system. The symptoms are, violent vomiting and purging (sometimes of blood), tenesmus, burning sensation in the mouth, throat, œsophagus, stomach, and intestines, constriction of the throat, with a sense of strangulation, griping pain in the bowels, small, and in some cases almost imperceptible pulse, faintness, cold sweats, tremblings, giddiness, blindness, dilated pupils, loss of voice, convulsions, and insensibility, terminating in death. A cutaneous eruption has in some instances followed the use of white hellebore. Hutchinson (Schwazte's *Pharm. Tab.* 2[te] Ausg.) remarked, that when death did not occur, palpitation and intermitting pulse, besides dyspeptic and nervous symptoms, remained for some time.

In its action on the sytem, Veratrum album is more closely related to cebadilla and meadow saffron than to any other medicinal agents. It is more acrid and less stupifying than Helleborus niger, with which it has been so frequently compared both by ancients and moderns. Orfila (*Toxicol. Gén.*) ascertained by experiment on animals that it is more active as a poison than the last-mentioned substance. It exercises no known chemical influence over the tissues by which it is distinguished from the mineral irritants, as baryta and emetic tartar, with which Schabel compared it.

Uses.—It is but rarely employed, principally on account of the alleged uncertainty of its operation. But from a few trials which I have made with it, I suspect this uncertainty is much exaggerated, and is principally referrible to the varying lengths of time which the rhizome has been kept after its removal from the earth, for, like colchicum, it deteriorates by keeping. The following are the principal cases in which it has been employed:—

1. *In affections of the nervous system*, as melancholia, mania, and epilepsy (Greding, *Sämmtl. mediz. Schriften*, T. 1, S. 179). As an emetic, purgative, and promoter of the secretions generally, we can easily understand that it may prove occasionally beneficial.

2. *In chronic skin diseases*, as herpes, Dr. C. Smyth (*Med. Communications*, vol. i. p. 207) gave the tincture internally with benefit. As external applications, the decoction and ointment are used in scabies (hence the Germans call the rhizome *Kratzwurzel*, i. e. *itch-root*), tinea capitis, &c.; but their use is not quite free from danger.

3. *In gout* it was given in combination with opium, by Mr. Moore (*Two Letters to Dr. Jones*, 1811), as a substitute for, or in imitation of, the *Eau Médicinale*. The dose, in a paroxysm of gout, was from forty minims to two drachms of a mixture composed of three parts of *Vin. Veratri albi* and one part of liquid laudanum.

4. *In amaurosis* and *chronic affections of the brain* occurring in torpid habits, it is employed as an errhine or sternutatory (hence its German name, *Niesswurzel*, i. e. *sneeze-root*). It is usually diluted with some mild powder. The German snuff called *Schneeberger* contains it.

5. *To destroy pediculi*, the decoction is used as a wash.

6. *As an emetic*, it was employed by Horn.

Administration.—The following are the principal modes of exhibition:—

1. *Pulvis Veratri.*—The dose of this at the commencement should not exceed one or two grains. This quantity will sometimes occasion nausea and vomiting; but Greding found that in some cases eight grains, and, in a few instances, a scruple of the bark of the rhizome in powder were required to excite vomiting. As an errhine, not more than two or three grains, mixed with eight or ten of some mild powder (as starch, liquorice, Florentine orris, or lavender) should be employed at one time.

2. *Vinum Veratri*, L.—White Hellebore, sliced, ℥viij.; Sherry Wine, Oij. (*imperial*). Macerate for fourteen days, and strain. As a substitute for Colchicum in gout and rheumatism, the dose is ten minims twice or thrice daily. This quantity is to be gradually increased. A full dose acts as an emetic and cathartic.

3. *Tinctura Veratri albi*, E.—Veratrum bruised, ℥iv.; Proof Spirit, Oj. Proceed by percolation or digestion, as directed for tincture of cinchona. The dose is five minims cautiously increased.

4. *Decoctum Veratri*, L. D.—White Hellebore, bruised, ℥x.; Distilled Water, Oij.; Rectified Spirit, f℥iij. Boil the hellebore in the water down to a pint, and when it has cooled add the spirit. This preparation is only used as an external application in skin diseases (scabies, lepra, tinea capitis, &c.), and to destroy pediculi. When the skin is very irritable,

the decoction will sometimes require dilution. If the surface to which it is applied be denuded, absorption of the veratria may occur, and constitutional symptoms be thereby induced; hence it is a dangerous application, especially to children.

5. *Unguentum Veratri*, L. D.—White Hellebore, powdered, ℥ij.; Lard, ℥viij.; Oil of Lemons, ♏xx. Mix. The Dublin College omits the oil of lemons. This ointment is used in the treatment of itch as a substitute for the disagreeable, though far more effective, sulphur ointment. Like the decoction, there is danger of the absorption of the active principle of the rhizome when the ointment is applied to raw surfaces: it is, therefore, an unfit remedy for children.

Powdered white hellebore is a constituent of the *Unguentum Sulphuris compositum* (vide p. 260).

Antidotes.—Astringent solutions have been recommended; and in one case, which fell under my notice, infusion of nutgalls seemed to give relief. The supposed benefit has been referred to the union of tannic acid with veratria, by which the solubility and activity of the latter are diminished; but Schabel (quoted in Brandt and Ratzburg's *Giftgewächse*, Abt. 1, p. 28) found that three drachms of a tincture of white hellebore given, with infusion of galls, to a cat, proved fatal in twenty minutes. Hahnemann recommends coffee, both as a drink and in clyster. Demulcent liquids, and in some cases opiates, may be useful. The other parts of the treatment must be conducted on general principles.

Asagræ'a officina'lis, Lindl.—*Spike-flowered Asagræ'a.*

Veratrum officinale, *Schlecht.*; Helonias officinalis, *Don, Ph. L. & Ed.*

Sex Syst. Hexandria, Trigynia.

(Semina: Sabadilla, *L. E.*)

History.—This plant was described by Schlechtendahl (*Linnea*, vi. 45), afterwards by Mr. Don (*Ed. New Phil. Journ.* Oct. 1832), and subsequently by Dr. Lindley (*Bot. Reg.* June 1839). The seeds were known to Monardes in 1572. They are called *Sabadilla*, or more properly *Cebadilla* (from the Spanish *Cebada*, *barley*), on account of the supposed resemblance of the inflorescence of the plant to that of *Hordeum*.

Fig. 113.

Asagræa officinalis.

a. Fruit-bearing stem.

b. Root, bulb, and leaves.

Botany. *Gen. Char.*—*Flowers* polygamous, racemose, naked. *Perianth* six-partite; *segments* linear, veinless, almost equal, with a nectarifluous excavation at the base, equal to the stamens. *Stamens* alternately shorter; *anthers* cordate, as if unilocular, after dehiscence shield-shaped. *Ovaries* three, quite simple, attenuated into an obscure *stigma*. *Follicles* three, acuminate, papery; *seeds* scimitar-shaped, corrugated, winged. *Bulbous herbs*, with grass-like *leaves*, and small, pale, densely-racemed *flowers*. *(Lindley.)*

Sp. Char.—The only species known.

Leaves linear, acuminate, subcarinate, roughish at the margin, four feet long, and three lines broad. *Scape* round, about six feet high. *Raceme*, a foot and a half long, very dense, very straight, spiciform. *Flowers* white, with a bractea at the base. *Anthers* yellow.

Hab.—Eastern side of the Mexican Andes, near Barranca de Tioselo (*Schiede*). Neighbourhood of Vera Cruz (*Hartweg*).

Description.—The *cebadilla*, *cevadilla*, or *sabadilla* of the shops (*sabadilla*, L. E. *semina sabadillæ mexicanæ*) comes from Vera Cruz and Mexico. It consists of the follicles (some containing seeds, others empty), loose seeds, stalks, and abortive flowers of the Asagræa officinalis.

The follicles, commonly termed capsules, rarely exceed, or even equal, half an inch in length, and are about one line or a line and a half in diameter. They are ovate-oblong, acuminate. Their colour is pale yellowish-brown, or reddish grey. The coat of each is thin, dry, and of a papery consistence. Each fruit is composed of three follicles mutually adherent towards the base, open at the superior and internal part. The receptacle, fruitstalk, and the remains of the dried and withered calyx, are usually present in the cebadilla of the shops. Seldom more than one or two, though sometimes three, seeds are found in each follicle.

The seeds are two or three lines long, scimitar-shaped, pointed, blackish brown, shiny, wrinkled or corrugated, slightly winged. Internally they are whitish and horny. Embryo straight, next the hilum, lodged in fleshy albumen. They have little odour, but a bitter, acrid, persistent taste.

Composition.—Two analyses of cebadilla have been made about the same time (1819): one by Meissner (*Schweigger's Journ. f. Chem.* xxxi. 187); and a second by Pelletier and Caventou (*Journ. de Pharm.* vi. 353). The following are the results:—

Meissner's Analysis.

Fatty matter (*olein* and *stearin*)	24·63
Wax (*myricin*)	0·10
Sabadillin (*veratria*)	0·58
Resin (soluble in ether)	1·45
Hard resin (insoluble in ether)	8·45
Bitter extractive with the acid which is united to the sabadillin	5·97
Sweet extractive	0·65
Extractive separable by alkalies	24·14
Gum	4·90
Vegetable jelly (*phyteumacolla*) with chloride of potassium and vegetable salts of potash	1·11
Oxalate of lime combined with bassorin	1·06
Lignin	20·56
Water	6·40
Cebadilla	100·00

Pelletier and Caventou's Analysis.

Fatty matter composed of	Olein. Stearin. Cevadic acid.
Wax.	
Supergallate of *veratria*.	
Yellow colouring matter.	
Starch.	
Lignin.	
Gum.	
Ashes composed of	Carbonate of potash. ——— lime. Phosphate lime. Chloride potassium. Silica.
Cebadilla.	

The ashes contained oxide of copper.

Cevadic acid is a crystalline, fusible, volatile, fatty acid, having an odour analogous to butyric acid. It is soluble in water, alcohol, and ether. It is obtained by the saponification of the *oil of cebadilla* (fatty matter). Cevadate of ammonia causes a white precipitate with the persalts of iron.

Oil of cebadilla given me by Mr. Morson is green, lighter than water, and has a faint, somewhat rancid taste.

The *acid* called *gallic* by Pelletier and Caventou is regarded as peculiar by Meissner, in consequence of its remarkable action on lime and barytic water, and on solutions of the protonitrate of mercury, protosulphate of iron, and sulphate of copper. It is, perhaps, the *veratric acid* of Merck (*Berl. Jahrb. für d. Pharm.* Bd. xli. H. iii. S. 411).

Veratria being a medicinal agent will be described presently.

The two *resins* found by Meissner, but overlooked by Pelletier and Caventou, are probably endowed with activity.

The *bitter extractive* of Meissner is the yellow colouring matter of Pelletier and Caventou.

Couerbe obtained from cebadilla seeds, *sabadillina*, *resin of veratria*, and *gum-resin of sabadillina*.

Resin of veratria (*veratrin*, Couerbe) is a brown solid, fusible at 365°. Insoluble in ether (by which it is distinguished from *veratria*,) and in water. It combines with acids, but neither saturates them, nor forms with them any crystallizable salts. It consists of $C^{28}\ H^{16}\ N\ O^{6}$. Its action on the animal economy has not been determined.

Gum resin of sabadillina (*resinigomme*, Couerbe: *monohydrate of sabadillina*, Alter.) is a reddish solid, soluble in water and alcohol, but slightly so in ether. It saturates acids, but does not form crystalline compounds with them. Alkalies throw it down from its saline combinations. It consists of $C^{20}\ H^{14}\ N\ O^{6}$. Hence it differs from anhydrous *sabadillina* in containing an atom more water. Furthermore it is distinguished from this alkali in not being crystallizable.

Sabadillina is said, by Simon (*Berl. Jahrb.* Bd. xxxix. S. 393), to be merely a compound of resinate of soda and resinate of veratria. Dr. Turnbull found it inferior in activity to veratria.

Chemical Characteristics.—The brownish coloured decoction of cebadilla reddens litmus, owing to the presence of free acid. Sesquichloride of iron deepens the colour of the decoction, and causes an olive brown precipitate. Alkalies deepen, whilst acids diminish, the colour of the decoction (by their action on the yellow colouring matter, *Pellet.*) Acetate and diacetate of lead, protonitrate of mercury, and sulphate of copper form precipitates in the decoction. Oxalate of ammonia renders it turbid (*oxalate of lime*). Nitrate of silver forms a coloured precipitate which is, for the most part, soluble in nitric acid: the insoluble portion is *chloride of silver*. Solution of iodine and tincture of nutgalls have no obvious effect.

Physiological Effects. (*a.*) *On vegetables.*—Not ascertained.

(*b.*) *On animals.*—Are similar to those of Veratrum album. Cebadilla has proved poisonous to dogs and cats (Willemet, *Nouv. Mém. de l'Acad. de Dijon*, 1782). A pinch of it produced violent spasms in cats; half a drachm caused vomiting and convulsions in dogs. It is a poison to insects. Thus bugs die from it in convulsions: hence its use as a bug poison! (Seeliger in Schmucker's *Vermischt. chirurg. Schrift.* vol. ii. p. 272.) Its efficacy in destroying pediculi has long been known.

(*c.*) *On man.*—The action is probably similar to, though more acrid than, white hellebore. The effects of *small and repeated doses* have not been satisfactorily ascertained. *Large and poisonous doses* cause burning and pain in the throat and stomach, nausea, vomiting, purging, prostration of strength, convulsions, delirium, and sometimes a cutaneous eruption. Even the external application of the powder has caused dangerous effects. Plenck tells us of a young man who was rendered temporarily insane by the application of powder of cebadilla to the head. Lentin says an infant, whose nurse had sprinkled the powder in its hair, died in convulsions. (Murray, *App. Med.* vol. v. p. 172.)

Rubbed on the skin, the tincture causes a stinging sensation similar to that produced by veratria. After its use for some days, a slight eruption appears on the skin. Rubbed over the cardiac region, it in some instances reduces the frequency and force of the pulse in a marked degree. The alcoholic extract has nearly the same effects, when taken internally, as veratria. It also induces sensations of heat and tingling on the surface of the skin, and sometimes acts as a diuretic. (Turnbull, *On the Medicinal Properties of the Ranunculaceæ*, p. 7).

Uses.—Cebadilla has been employed internally, as an *anthelmintic*, in both thread-worms and tape-worms. (Schmucker's *verm. chirurg. Schrift.* Bd. ii. S. 271). Dr. Turnbull (*op. cit.* p. 7) has given the extract with benefit in painful rheumatic and neuralgic affections. Though it is applicable in all the maladies for the relief of which veratria has been recommended, it is rarely administered by the mouth.

Externally the powder of the seeds has been used to destroy pediculi; hence the Germans called the seeds *Läusesaamen*, or *lice-seeds*. But it cannot be applied with safety to children, and especially when the skin is broken. I have already referred to the dangerous consequences of its employment. The tincture has been used as a rubefacient in chronic rheumatism, and, rubbed over the heart, in some cases of nervous palpitation. (Turnbull, *op. cit.*). It may in fact be employed as a cheap though efficient substitute for the tincture of veratria.

But the principal use of the seeds, for which indeed they have been introduced into the Pharmacopœia, is for yielding veratria.

Administration.—The following are the preparations of Cebadilla which have been employed in medicine.

1. *Pulvis Sabadillæ.—Pulvis contra pediculos; Poudre de Capucin; Powder of Cebadilla.* The dose for an adult is from two to six grains, gradually increased. In one case of tape-worm, half a drachm was taken daily for fourteen days (Seeliger in Schmucker, *op. cit.* vol. ii. p. 271).

2. *Tinctura Sabadillæ.—Saturated tincture of Cebadilla*, Turnbull. Cebadilla seeds, freed from their capsules and bruised, *any quantity;* Rectified Spirit, *as much as will cover them.* Digest for ten days. Used as a rubefacient liniment in chronic rheumatism and paralysis. It is rubbed over the heart in nervous palpitation.

3. *Extractum alcoholicum Sabadillæ.*—Evaporate the saturated tincture, with a very gentle heat, to a proper consistence. Dose 1-6th of a grain, gradually increased. It is given, in the form of pill, in rheumatic and neuralgic cases.

4. *Veratria*, L.; *Veratrine*, Fr.; *Veratrina*, Thomson; *Sabadillin*, Meissner.

(*a.*) *History.*—This vegetable alkaloid was discovered about the same time (1819), by Meissner in Germany, and by Pelletier and Caventou in France. Couerbe (*Ann. de Chim. et de Phys.* t. 52, p. 368) probably was the first who obtained it pure.

(*b.*) *Preparation.*—The following process for making veratria, contained in the London Pharmacopœia, is nearly identical with that described by Soubeiran (*Nouv. Traité de Pharm.* t. ii. p. 190), and is a modification of one given by Couerbe.

"Take of Cebadilla, bruised, lb. ij.; Rectified Spirit, Cong. iij.; Diluted Sulphuric Acid; Solution of Ammonia; Purified Animal Charcoal; Magnesia; each as much as may be sufficient. Boil the Cebadilla with a gallon of the spirit, for an hour, in a retort to which a receiver is fitted. Pour off the liquor, and boil what remains with another gallon of spirit and the spirit recently distilled, and pour off the liquor: and let it be done a third time. Press the Cebadilla, and let the spirit distil from the mixed and strained liquors. Evaporate what remains to the proper consistence of an extract. Boil this three or more times in water, to which a little diluted sulphuric acid has been added, and with a gentle heat, evaporate the strained liquors to the consistence of a syrup. Into this, when cold, put the magnesia to saturation, frequently shaking [them]; then press, and wash. Let this be done twice or thrice: then dry what remains, and digest with a gentle heat in spirit two or three times, and as often strain. Afterwards let the spirit distil. Boil the residue in water, to which a little sulphuric acid and animal charcoal are added, for a quarter of an hour, and strain. Lastly, the charcoal being thoroughly washed, cautiously evaporate the [mixed] liquors until they have the consistence of a syrup, and drop into them as much ammonia as may be sufficient to throw down the veratria. Separate this, and dry it."

The process of the Edinburgh Pharmacopœia is as follows:—

"Take any convenient quantity of Sabadilla: pour boiling water over it in a covered vessel, and let it macerate for 24 hours; remove the Sabadilla, squeeze it, and dry it thoroughly with a gentle heat. Beat it now in a mortar, and separate the seeds from the capsules by brisk agitation in a deep narrow vessel. Grind the seeds in a coffee-mill, and form them into a thick paste with rectified spirit. Pack this firmly in a percolator, and pass rectified spirit through it till the spirit ceases to be coloured. Concentrate the spirituous solutions, by distillation, so long as no deposit forms, and pour the residuum, while hot, into twelve times its volume of cold water. Filter through calico, and wash the residuum on the filter so long as the washings precipitate with ammonia. Unite the filtered liquid with the washings, and add an excess of ammonia. Collect the precipitate on a filter, wash it slightly with cold water, and dry it first by imbibition with filtering paper, and then in the vapour bath. A small additional quantity may be got by concentrating the filtered ammoniacal fluid, and allowing it to cool.

"Veratria thus obtained is not pure, but sufficiently so for medicinal use. From this coloured substance it may be obtained white, though at considerable loss, by solution in very weak muriatic acid, decolorization with animal charcoal, and re-precipitation with ammonia."

(*c.*) *Theory.*—The following statement applies to the process of the London College, and is perhaps correct as far as it goes:—Cebadilla yields to rectified spirit veratria in combination with a vegetable acid. When the alcoholic extract is treated with water and sulphuric acid, an impure solution of the sulphate of veratria is obtained. Magnesia decomposes this, unites with the sulphuric and vegetable acids, and sets free the alkaloid, which is taken up by rectified spirit. The extract obtained by distilling off the spirit is then boiled in water with sulphuric acid and animal charcoal: the acid unites with the alkaloid, while the charcoal abstracts colouring matter. Ammonia being added to the strained solution, combines with the sulphuric acid, and occasions a precipitate, which, when dried, constitutes *commercial* or *medicinal veratria* (*veratria*, Ph. L.)

By Couerbe's process, a drachm of commercial veratria may, it is said, be procured from one pound of cebadilla.

Commercial veratria was said by Couerbe to be composed of *pure veratria*, *sabadillina*, *resin of veratria* (veratrin, *Couerbe*), and *gum-resin of veratria* (resinigomme, *Couerbe*). These are separated from each other by the successive action of water, ether, and alcohol, as shewn by the following table:—

Commercial Veratria	yields to boiling water......	1. *Sabadillina*, which crystallizes on cooling.
		2. *Resin of veratria*, left in the cold solution.
	insoluble in boiling water ..	3. *Veratria*, soluble in ether.
		4. *Gum-resin of veratria*, insoluble in ether, but soluble in alcohol.

The nature of sabadillina has been already pointed out (p. 635).

(*d.*) *Properties.*—*Commercial veratria* is pulverulent, odourless, and greyish or brownish white. All the samples I have tasted were bitter and acrid, and produced a feeling of numbness and tingling when applied to the tongue. But *pure veratria* is an almost white, friable, solid, having the aspect of a resin: it is uncrystallizable, odourless, has a very acrid taste, without any mixture of bitterness. It is fusible at 240° F. It is sparingly soluble in ether, readily so in alcohol, scarcely so in cold water. It possesses alkaline properties: thus, it restores the blue colour of reddened litmus, and saturates acids. Its salts crystallize with difficulty: indeed the *sulphate* and *hydrochlorate* alone have been obtained in the state of crystals; the other salts have a gummy aspect. Both the hydrochlorate and sulphate are soluble in water.

(*e.*) *Characteristics.*—Veratria is known by the following characters:—Its alkalinity, its combustibility, its uncrystallizability, the difficult crystallizability of its salts, its solidity at ordinary temperatures, its ready solubility in alcohol, its being almost insoluble in water, but sparingly soluble in ether, and by the intense red colour which it assumes when mixed with strong liquid sulphuric acid. Nitric acid renders commercial veratria reddish, and forms a yellow solution with it. A solution of veratria in dilute acetic acid produces a whitish precipitate (*tannate of veratria*) with tincture of nutgalls, a white one (*hydrated veratria*) with ammonia, and an intense red colour with concentrated sulphuric acid. To these chemical peculiarities must be added, those characteristics derived from its physiological effects:—A minute portion of veratria causes violent sneezing, and a small quantity of a solution of four grains of veratria in a fluid drachm of rectified spirit, rubbed on the wrist or forehead, produces, within three or four minutes, heat and tingling.

(*f.*) *Composition.*—The following is the composition of pure veratria, according to Couerbe:—

	Eq.	Eq. Wt.	Per Cent.	Couerbe.
Carbon	34	204	70·83	70·786
Hydrogen	22	22	7·64	7·636
Nitrogen	1	14	4·86	5·210
Oxygen	6	48	16·67	16·368
Veratria	1	288	100·00	100·000

(*g.*) *Physiological Effects.* α. *On animals.* — Magendie (*Formulaire*, p. 162, 8^{me} ed.) has shewn that the local action of veratria is that of an irritant. Placed in the nostrils of a dog the acetate of veratria provoked violent and continued sneezing. When introduced into the intestinal canal it caused inflammation. Applied to parts whence absorption goes on actively (as the pleura and tunica vaginalis), it occasions tetanus and death in a few minutes. Forcke (*Untersuch. über d. Veratrin*, 1837) gave moderate and gradually increased doses ($\frac{1}{8}$ to $\frac{1}{4}$ of a grain) of veratria for 20 days. It caused vomiting, and occasionally foaming at the mouth. The stools continued hard. Dr. Bardsley (*Hosp. Facts and Observ.* 1829) observed vomiting and giddiness (reeling) produced in animals to whom he gave veratria.

β. *On man.*—Applied to the nose a minute quantity excites excessive sneezing. Rubbed on the skin in the form of ointment, it causes a sensation of heat and tingling (called by Dr. Turnbull *electro-stimulation*). This effect is not confined to the part and its immediate neighbourhood, where the application has been made: for somewhat similar sensations are occasionally experienced in distant parts.

Taken internally in *small* or *medicinal doses* veratria excites a feeling of warmth in the stomach and bowels, which extends to the chest and extremities. Tingling and various anomalous sensations (as of a current of hot or cold air or water passing over the skin) are perceived in various parts of the body. Nausea and vomiting are occasionally excited by a full dose. On the secretions and exhalations its action is not very uniform. It frequently produces perspiration, not unfrequently diuresis. Forcke (*op. cit.* p. 22) mentions increased secretion of saliva and of tears produced without the contact of the veratria either with the conjunctiva and mouth. The bowels are for the most part confined, so that purgatives are not unfrequently required during the use of it. Yet in some cases veratria has caused copious bilious evacuations. In some instances it has promoted, in others diminished, the appetite. Forcke mentions a pustular eruption as being sometimes induced by it. Dr. Bardsley generally found the pulse become slower and depressed after the use of veratria.

I am not acquainted with any cases of poisoning in the human subject by the use of *excessive doses* of veratria. Vomiting and convulsions would probably be induced.

(*h.*) *Uses.*—Veratria is employed externally or internally: sometimes in both ways at the same time. It has been tried in the following cases:—

α. *In neuralgia* it has been used by Dr. Turnbull, Dr. Ebers of Breslau (Dierbach, *Neuest. Entd. in d. Mat. Med.* 1837), and Dr. Forcke. It is applied in the form of ointment, containing from twenty to forty grains of veratria to an ounce of lard. The frictions are to be continued until the heat and tingling caused by the veratria have acquired a considerable degree of intensity. Though, according to my own experience, it fails to give relief in a large majority of cases, yet in some few its effects are highly beneficial, and in none is it injurious. As a remedy for neuralgia, it is, however, far inferior to *Aconitum* and its alkali *Aconita.*

β. *In some nervous diseases* (Neuroses, *Cull.*)—Veratria has been extensively used in this class of diseases, but for the most part empirically. If it possess any therapeutical power "a more extended experience is required to establish its claim to our regard" (Paris, *Appendix* to the 8th ed. of the *Pharmacologia.*) Among the maladies against which it has been used (in some instances internally, but mostly externally) are,—nervous palpitation, paralysis, hooping-cough, epilepsy, hysteria, hypochondriasis, &c. (See the treatises of Turnbull and Forcke, before referred to.)

γ. *In rheumatism and gout.*—Dr. Bardsley gave it internally in rheumatism, but with no remarkable results. Externally it has been employed in the form of ointment by Sir C. Scudamore and Dr. Turnbull. It should not be applied while the inflammation is of an active kind. It would appear to be best adapted for the neuralgic forms of rheumatism.

δ. *In dropsy.*—Dr. Bardsley administered it internally in dropsy, but says it possesses "no *particular* claims to the attention of the profession." Ebers employed veratria endermically, and also, in the form of ointment, epidermically. It acted as a diuretic, and gave relief. (See Forcke's *Untersuch.*)

(*i.*) *Administration.*—The ordinary veratria of the shops is administered in doses of one-sixth of a grain, three times a day. On account of its acridity it should not be given in solution, but in the form of pills.

α. *Pilulæ Veratriæ; Veratria Pills;* Turnbull.—Veratria, gr. j.; Extr. of Hyoscyamus; Liquorice powder, āā gr. xij. Let 12 pills be made, of which one may be taken every three hours.

β. *Tinctura Veratriæ; Veratria Embrocation;* Turnbull.—Veratria, ʒj.; Rectified Spirit, ℥ij. Dissolve. This embrocation is sometimes used as a substitute for the ointment. Magendie (*Formulaire*) directs a tincture of veratria to be prepared by dissolving four grains of the alkali in an ounce of alcohol. Of this from 10 to 25 drops are taken, in a cup of broth, as a substitute for the tincture of colchicum.

γ. *Unguentum Veratriæ; Veratria Ointment;* Turnbull.—Veratria, ʒss.; Olive Oil, ʒj. Prepared Lard, ℥j. M.

δ. *Sales Veratriæ.—The sulphate and tartrate of veratria* (prepared by saturating veratria with sulphuric or tartaric acid) are sometimes used instead of the uncombined alkali. The dose and mode of administration are the same as for the latter.

ANTIDOTE.—Vide VERATRUM ALBUM.

Other Medicinal Melanthaceæ.

The fruit and seeds of *Veratrum Sabadilla*, Ph. Ed. are said to be brought from the Antilles, under the name of *Cebadilla* (*semina sabadillæ Caribææ*), but I have never met with them. *V. Sabadilla* is a native of Mexico and the Antilles. Its leaves are radical, oval-oblong, obtuse, ribbed. Its stem is almost leafless. The panicle is nearly simple. The flowers have short pedicels, and are nodding. The rhizome of *Veratrum viride* is used in the United States as a substitute for that of Veratrum album.

ORDER XII. LILIA'CEÆ, *Lindl.*—THE LILY TRIBE.

ESSENTIAL CHARACTER.—*Calyx* and *corolla* confounded, coloured, regular, occasionally cohering in a tube. *Stamens* six, inserted into the sepals and petals; *anthers* opening inwards. *Ovary* superior, three-celled, many seeded; *style* one; *stigma* simple or three-lobed. *Fruit* succulent, or dry and capsular, three-celled. *Seeds* packed one upon another in one or two rows; *embryo* with the same direction as the seed, in the axis of fleshy *albumen*, or uncertain in direction and position. *Roots* fibrous or fasciculate. *Stem* none, except a bulb; or tuberous, or creeping, or erect, or arborescent. *Leaves* with parallel veins, membranous, not articulated with the stem; either sessile or with a narrow leafy petiole. (*Lindley*).

PROPERTIES.—Not uniform.

Al'oë, Linn.—*Al'oe.*

Sex. Syst. Hexandria, Monogynia.

(Succus proprius spissatus foliorum ex variis Aloës speciebus).

HISTORY.—Neither Aloe plants nor the inspissated juice of their leaves are mentioned by Hippocrates or Theophrastus; but both are described by Dioscorides (lib. iii. cap. xxv), and Pliny (*Hist. Nat.* lib. xxvii. cap. v.)

BOTANY. *GEN. CHAR.*—*Perianth* tubular, six-cleft, fleshy, nectariferous at the base, the sepals of the same form as the petals, and closely imbricating them. *Stamens* hypogynous, as long as the perianth, or even longer. *Capsule* membranous, scarious, three-corned, three-celled, three-valved, with a loculicidal dehiscence. *Seeds* numerous, in two rows, roundish or angular. (*Lindley*.)—Succulent plants.

Species.—The following species furnish the greater part of the substance called in the shops *aloes*:—

Fig. 114.

Various species of Aloë.

1. *Al'oë vulga'ris*, Lam. Dub.—'Αλόη, Dioscor. Sibth. *Stem* woody, simple, cylindrical, short. *Leaves* fleshy, amplexicaul, first spreading, then ascending, lanceolate, glaucous green, flat above, convex below, armed with hard, distant, reddish spines, perpendicular to the margin; a little mottled with darker colour; the parenchyma slightly coloured. brown, and very distinct from the tough leathery cuticle. *Scape* axillary, glaucous reddish, branched. *Spike* cylindrical-ovate. *Flowers* at first erect, then spreading, afterwards pendulous, yellow, not larger than the stamens. (*Lindley.*) Beneath the epidermis of the leaves, in peculiar parallel vessels, is found a brownish-yellow, bitter, resinous juice. This plant is a native of the East Indies and Barbary, and is cultivated in the West Indies, Italy, Sicily, and Malta. It yields *Barbadoes Aloes*. *A. vulgaris* has been subdivided by some botanists into *A. abyssinica* and *A. barbadensis*.

2. *Al'oë socotri'na*, Lam. Dec.—*Stem* woody, straight, one and a half feet high or more, naked below, where it is strongly marked with the scars of leaves. *Leaves* amplexicaul, ascending, ensiform, green, curved inwards at the point, convex below, rather concave above, marked with numerous small white marginal serratures, the parenchyma abounding in a bright brownish-yellow juice. *Raceme* cylindrical, unbranched. *Flowers* scarlet at the base, pale in the middle, green at the point. *Stamens* unequal, three of them longer than the flowers. (*Lindley*). The leaves contain in peculiar vessels a yellow juice, which, when exposed to the air, becomes violet, and ultimately brown. This juice is more copious and bitter than that of Aloë vulgaris. *Aloë socotrina* is said to be a native of the island of Socotra, and to yield *socotrine* (and *real hepatic?*) *aloes*; but further evidence is required to establish these statements. Lieut. Wellstead (*Journ. of the Royal Geograph. Soc.* vol. v.) says the hills on the west side of this island are covered for an extent of miles with aloe plants; and he observes that it is not likely, at any future period, that the whole quantity will be collected which might be required.

Fig. 115.

Aloë socotrina.

3. *Al'oë spica'ta*, Thunb. Lond. Dub.—*Stem* three to four feet high, as thick as a man's arm. *Leaves* thick, fleshy, broad at the base, gradually narrowing to the point, channelled, full two feet long, distantly toothed, with a few white spots; their parenchyma almost colourless. *Spike* a foot long, very compact, with the flowers campanulate and

horizontal. The three petals broader, ovate, obtuse, white, with a triple green line, the sepals narrower, less concave. *Stamens* much longer than the perianth. The flowers are filled with a purplish honey. (*Lindley.*) This species is a native of the interior of the Cape of Good Hope, and yields *Cape Aloes.*

Preparation.—The finest kind of aloes is obtained by evaporating the juice which flows spontaneously from the transversely-cut leaves. This juice is lodged in vessels running longitudinally beneath the epidermis. The exudation of it is promoted by dipping the leaves in hot water. But if pressure be employed the proper aloetic juice becomes mixed with the mucilaginous liquid of the leaves, and thus an inferior kind of aloes is obtained. A still commoner variety is procured by boiling the leaves, from which the juice has been previously allowed to escape, in water.

In the island of Socotra the leaves are plucked at any period, and by any one who chooses to take the trouble; and after being placed in a skin, the juice is allowed to exude from them (Wellstead, *Journ. Geograph. Soc.* vol. v.)

In Barbadoes the aloes is best procured in the month of March. It is obtained as follows:—"Every slave hath by him three or four portable tubs. The leaves being cut near the roots, are thrown into these, with their broken ends downwards; and as the leaves are full of large longitudinal veins or vessels, they yield an easy passage to the juice (which is of a greenish-yellow colour) to drip out. This being boiled for about five hours in a copper or kettle, the watery particles evaporate, and the remainder comes to a consistency and thickening as sugar doth when sufficiently boiled. The way to know when it is enough boiled is, to dip a stick in the liquor, and observe whether the aloe sticking to it, when cold, breaks short: if it doth, then it is boiled to perfection, and fit to be poured into gourds or calabashes, or other vessels, for use" (Hughes, *Nat. Hist. of Barbadoes*, p. 154. This account is further confirmed by that of Mr. Millington, *Lond. Med. Journ.* vol. viii. p. 422.) Dr. Wright (*Lond. Med. Journ.* vol. viii. p. 219) says, that, in Jamaica, the leaves, contained in hand-baskets or nets, are boiled in water, and the strained liquor evaporated to a proper consistence, and then poured into gourds or calabashes.

Description and Varieties.—1. *Socotrine Aloes* (*Aloë socotrina* seu *succotrina: Aloë socotorina*, Ph. Ed.) A few years ago, this kind of aloes was brought by way of Smyrna, and hence was frequently termed *Turkey Aloes*. It is now, however, usually imported from Bombay. It comes over in skins, contained in casks, kegs, and chests. It is of a reddish brown colour, glossy, pellucid, and having a smooth conchoidal fracture. By exposure to the air it becomes deeper coloured. Its taste is very bitter; its odour has been compared to that of myrrh, being pleasant and aromatic. The colour of the powder is bright yellow. The finest kinds of Socotrine aloes, which I have met with, have had the semi-transparent red colour observed when we break a large fine tear of myrrh. Heated on the point of a knife in the candle, a most fragrant odour is evolved; and by distillation with water, we obtain a liquid having the fragrant odour of the aloes, but free from any bitter taste. It has long been regarded as the best kind of aloes, though its commercial value is at the present time inferior to that of Barbadoes aloes.

Socotrine aloes is mentioned by Avicenna and Mesue, both of whom regarded it as the best kind. By Fée (*Cours d'Hist. Nat. Pharm.* t. i. p. 325), and some other continental writers, it is confounded with Cape aloes.

The aloes prepared in the island of Socotra is probably procured from *Aloë socotrina.* In 1833, the quatity exported from this islannd was 83 skins, or 2 tons. But a much larger quantity might be procured if required (Wellstead, *Journ. Geograph. Soc.* vol. v.) Sir Whitelaw Ainslie (*Materia Indica*, vol. i. p. 9) says that the greater part of the extract now sold under the name of Socotrine aloes is prepared in the kingdom of Melinda.

I have never seen the Socotrine aloes of commerce adulterated. But two samples (one of which I have in my museum) brought direct from the island of Socotra, by a friend of Professor Royle, are largely intermixed with foreign substances, as sand, skins, &c.

2. *Genuine Hepatic Aloes: Liver-coloured Socotrine Aloes* (*Aloë hepatica vera. ? Aloë indica*, Ph. Ed.)—I have never met with any description of this kind; and I suspect continental writers confound it with the foregoing variety. In English commerce it is always regarded as distinct.

It is brought to us from Bombay in skins, contained in casks holding from 200 to 300 pounds. Its odour is very much the same as that of the Socotrine kind, or perhaps it is a little less fragrant. It is distinguished from the latter by its opacity and its liver colour. The similarity of the odour of Socotrine and hepatic aloes leads to the suspicion that they are obtained from the same plant; and which is further confirmed by the two being sometimes brought over intermixed, the Socotrine occasionally forming a vein in a cask of the hepatic aloes. By digestion in rectified spirit of wine, a yellowish granular powder (in appearance something like lycopodium) is obtained, which is insoluble in water, alcohol, æther, and dilute sulphuric acid, but is readily soluble in a solution of caustic potash, forming a red-coloured liquid.

3. *Barbadoes Aloes: Aloes in gourds* (*Aloë barbadensis*, Ph. Ed.)—This is the kind denominated by most continental writers (as Geiger, Theod. Martius, Pfaff, Fée, and others,) *Hepatic Aloes* (*Aloë hepatica*), but its colour is not constantly that of the liver. It is imported from Barbadoes or Jamaica in gourds, weighing from 60 to 70 pounds, or even more than this. It varies in colour from a dark brown or black (*brown* or *black Barbadoes aloes*) to a reddish-brown or liver colour (*liver-coloured* or *hepatic Barbadoes aloes*): even in the same gourd a difference of colour is occasionally observed. The fracture also varies, sometimes being dull, at other times glossy. Its unpleasant odour, (which is much increased by breathing on it) will always distinguish it from the foregoing kinds. Its powder is of a dull olive-yellow colour. This kind of aloes is obtained from the *Aloë vulgaris.*

4. *Cape Aloes* (*Aloë capensis: A. lucida* of Geiger).—This kind is imported, as its name indicates, from the Cape of Good Hope. It is brought over in chests and skins, the latter being preferred, as the aloes contained therein are usually purer and more glossy. It has a shining resinous appearance, is of a deep brown colour, with a greenish tint, and has a glossy or resinous fracture; its edges, or thin laminæ, viewed by transmitted light, have a yellowish-red or ruby colour; its odour is stronger

and more disagreeable than the Barbadoes aloes; its powder is greenish yellow. Some of the commoner kinds of Cape aloes have a rough fracture.

Occasionally it has been imported of a reddish-brown colour, like that of the liver, and opaque, (*liver-coloured* or *hepatic Cape aloes*). About five years since, an experienced dealer bartered 3 lbs. of Cape aloes for 1 lb. of what he thought to be the genuine hepatic aloes, but which turned out to be a fine sort of Cape aloes. I presume this is the kind which Professor Guibourt (*Hist. des Drog. simpl.* t. ii. p. 418, 3^me ed.), to whom I sent a specimen of it, terms *Aloès hépatique faux*. Its odour, when breathed on, instantly detects it.

Cape aloes is procured from *Aloë spicata*, and perhaps also from other species, as *A. arborescens*, Mill., *A. Commelyni*, Willd., *A. mitriformis*, Willd. (Lindley, *Flora Medica*).

5. *Fetid, Horse*, or *Caballine Aloes* (*Aloë caballina*).—I have never met with any aloes under this name in English commerce. From Professor Guibourt I have received two substances which he denominates *Aloès Caballin*.

α. One is *impure* or *foot Cape aloes*.

β. The other is in black, opaque masses. Its fracture is uniform. It is difficult to pulverise, adheres to the pestle, gives a greenish powder, has very little odour, and yields a dark brown decoction. It is probably an extract prepared by boiling the leaves in water.

Professor Guibourt (*Hist. des Drog.* ii. 419) says Caballine aloes is procured either in the countries which furnish ordinary aloes, or in Spain or Senegal.

6. *Mocha Aloes* (*Aloë de Mochâ*).—Under this name I found in a drug warehouse, where it had lain for many years, an impure kind of aloes, in large irregular masses, opaque and black externally, intermixed with sand, strings, &c. In its brittleness, odour, and the pale colour of its decoction, it resembles Cape aloes. The interior of the mass is not uniform: in some places it is dark and opaque, somewhat like Barbadoes aloes, in other places it resembles Socotrine aloes, and here and there we find portions having the transparency and resinous appearance of Cape aloes. Recently this kind of aloes has been imported under the name of Mocha aloes from Muscat, in chests containing nearly 2 *cwt.* each.

7. *Indian Aloes* (*Aloë indica*).—Through the kindness of Professor Royle I have examined four kinds of aloes brought from the interior of India:—

α. *Aloes from Northern India.*—Is dull, black, and brittle, and has little odour. It came from the northern parts of India, where it is common in the bazaars. It is probably the kind which Ainslie (*Mat. Ind.* vol. ii. p. 10) says resembles Barbadoes aloes.

β. *Guzerat Aloes.*—Is dark, more gummy in its appearance and feel, more difficult to fracture. It came from Guzerat.

γ. *Salem Aloes.*—In blackish masses. It was brought from Salem. It is distinguished from all the preceding by the numerous large air cavities observed in its interior. Its odour is analogous to that of Socotrine aloes. Its price is marked one anna and nine pice [about twopence-halfpenny] per pound.

δ. *Trichinopoli Aloes.*—Resembles Cape aloes in its brittleness, odour, and colour, but is more opaque. Its price is marked two annas [about threepence] a pound.

These aloes are probably the produce, in part at least, of *Aloë indica*, Royle; a species with reddish flowers, common in dry situations in the north-western provinces of India, and which, if known to Roxburgh, was included by him in the *A. perfoliata*, Linn. and perhaps also of *A. vulgaris*, or the plant mentioned by Rheede (*Hort. Malab.* ii. t. 3,) (Royle, *Bot. of the Himalayan Mountains*).

COMPOSITION.—Aloes has been analysed by Trommsdorf (*Ann. de Chim.* t. lxviii. p. 11, 1808), by Bouillon-Lagrange and Vogel (*ditto*, p. 155), by Braconnot (*Journ. de Physiq.* t. lxxxiv. p. 334, 1817), and by Winkler, (Geiger, *Handb. d. Pharm.* Bd. ii. p. 782, 1829).

Trommsdorf.			Bouillon-Lagrange and Vogel.			Braconnot.		Winkler.		
	Socotrine.	*Barbadoes.*		*Soc.*	*Bar.*		*Soc.*		*Soc.*	*Bar.*
Saponaceous princip.	75	81·25	Extractive	68	52	Bitter princip.	73	Bitter matter	50	60
Resin	25	6·25	Resin	32	42	Puce do.	26	Resin	50	35
Vegetable albumen	0	12·5	Vegetable albumen	0	6	Impurities	1	Albumen	0	5
Gallic acid	trace	trace								
Aloes	100	100·00		100	100		100		100	100

1. *Aloesin*, Pfaff, (*Saponaceous principle; Extractive; Bitter principle or matter*) is the principal constituent of aloes. It is contained in the cold infusion of aloes, and also in a decoction which has cooled; it may be obtained from either by evaporation. Thus procured, it is a brown and bitter mass, readily soluble in water, but difficultly so in spirit of wine. In pure alcohol or ether it is said to be insoluble, or nearly so. Besides carbon, hydrogen, and oxygen, it contains nitrogen, for it yields ammonia by destructive distillation, and furnishes carbazotic acid when treated by nitric acid. Aloesin is probably a mixture or compound of various proximate principles. Obtained as above, Braconnot says it contains some of the *puce-coloured principle*, which may be removed by oxide of lead.

2. *Resin.*—The substance which deposits from a decoction of aloes as it cools is usually denominated resin. Braconnot says it is a mixture of aloesin and *puce-coloured principle:* Berzelius, that it is *apothême* combined with unaltered extract. It is transparent, brown, fusible, soluble in alcohol, ether, and alkaline solutions. The *puce-coloured principle* of Braconnot is an odourless and tasteless powder, combustible, but not fusible; and is prepared by digesting aloes with water and oxide of lead—a compound of the puce principle and the oxide is procured, which is to be washed and decomposed by weak nitric acid: the oxide is dissolved, and the puce principle left. From Braconnot's observations, this principle seems to be rather oxidized extractive (*apothême*, Berz.) than resin.

3. *Vegetable albumen.*—This term is applied to a substance insoluble in both water and alcohol.

4. *Aloetic acid*, (*Gallic acid*, Trommsdorf.)—A solution of aloes reddens litmus, darkens ferruginous solutions, but does not precipitate gelatin: hence Trommsdorf assumed the presence of gallic acid. But while gallic acid causes a blue colour with the persalts of iron, infusion of aloes produces an olive brown one. Furthermore, if excess of diacetate of lead be added to the infusion, and sulphuretted hydrogen be passed through the filtered liquor, to throw down the excess of lead, the boiled and strained liquor possesses the property of becoming olive brown on the addition of sesquichloride of iron. Hence it appears to me that the acid is a peculiar one, and I have, therefore, termed it *aloetic acid.* It must not be confounded with *artificial aloe bitter*, called by Braconnot *aloetic acid*, and which is prepared by the action of nitric acid on aloes: Liebig (Poggendorf's *Annalen*, xiii. 205) has shewn this to be a mixture of nitric or nitrous acid, carbazotic acid, and a peculiar, non-acid, resinous red matter.

Meissner (Pfaff's *Mat. Med.* vol. vii. p. 171) has given the name of *Aloine* to a supposed alkali in aloes. Its solution was brown, and acted as an alkali on reddened litmus paper. With sulphuric acid, aloine formed a crystalline salt.

Winkler (Schwartz, *Pharm. Tabell.* p. 294, 2te Ausg.) regards aloes as a neutral vegetable salt, composed of two peculiar basic substances (viz. a non-bitter resin, and a bitter substance,) and an acid, viz. a colouring, non-bitter matter.

Fabroni (*Ann. de Chim.* xxv. 301) obtained a fine violet colour from the recent juice of the Aloë, which has been proposed as a dye for silk. It is formed by the action of the oxygen of the air on the juice.

Chemical Characteristics.—Aloes is almost completely soluble in boiling water: as the decoction cools the substance called resin (aloesin and puce-coloured principle, *Braconnot*) deposits. The clear solution reddens litmus, strikes a deep olive brown tint (*aloetate of iron*) with sesquichloride of iron, is deepened in colour by alkalies, but is unchanged by gelatin. Diacetate of lead forms a copious yellow precipitate with it.

The cold decoction of Cape aloes is much paler coloured than that of any other kind of aloes. Barbadoes aloes yields the deepest coloured decoction.

Physiological Effects. (*a.*) *On vegetables.*—Not ascertained.

(*b.*) *On animals.*—Aloes is the ordinary purgative for solipedes (the horse, the ass, the zebra, &c.) as it is both safe and sure. In horses, previously prepared by two or three bran-mashes to soften the dung, the dose is from five to seven drachms (Youatt, *The Horse*, p. 211). It acts slowly, requiring from eighteen to forty-eight hours for its operation (Moiroud, *Pharm Vétér.* p. 264). Mr. Youatt informs me that aloes is a valuable purgative for the dog, in doses of from one to three drachms, and with the addition of from one to three grains of calomel. Barbadoes aloes is preferred by veterinarians, as being more effective than Cape aloes, in the ratio of about seven to five. Aloes proves purgative to oxen, sheep, and pigs, but, as in the other cases, operates slowly (Viborg in Wibmer's *Wirk. d. Arzneim*). Moiroud (*op. cit.*) injected into the veins of a horse four drachms of aloes dissolved in water with a little alcohol, and the next day an ounce, without any other effect than the evacuation of a large quantity of urine. The dung, however, was enveloped by a thin pellicle formed by altered intestinal mucus. This was collected and analyzed subsequent to the death of the animal (which followed three days after the injection): it offered scarcely any traces of the constituents of the bile.

(*c.*) *On man.*—Taken internally *in small doses*, aloes acts as a tonic to the alimentary canal, assisting the digestive process, strengthening the muscular fibres, and promoting the secretions, especially that of the liver, which organ it is thought specifically to influence. *In large doses* it acts as a purgative. There are, however, some peculiarities attending its cathartic operation deserving of notice. In the first place, these effects are not so speedily produced as by some other purgatives; for eight, twelve, and sometimes twenty-four hours elapse before they take place. Secondly, aloes acts especially on the large intestines, and a full dose is in some persons apt to produce heat and irritation about the rectum and tenesmus, and, in those troubled with hemorrhoids, it is said not unfrequently to increase, or even to bring on, the sanguineous discharge. Fallopius (*Opera omnia*, p. 109, Francof. 1600) tells us, that of one hundred persons who used aloes as a purgative, ninety were affected with the hemorrhoidal flux, which ceased when the use of aloes was omitted. But though this statement has been often referred to, it is of little importance, as no evidence is offered that the disease was brought on by aloes. The uterus, in common with all the pelvic viscera, is stimulated by aloes. A determination of blood towards these organs, and a fulness of the bloodvessels (especially of the veins), are produced, and thus uterine irritation and menorrhagia are apt to be increased by aloes, while in amenorrhœa and chlorosis it may occasionally act as an emmenagogue. Dr. Wedekind (*Rust's Magazine*, 1827, Bd. 24, Heft 2, S. 304) says that small doses of aloes often occasion erection, and increase the sexual feelings.

The purgative effects of aloes do not arise merely from their local action on the alimentary canal, since this effect is sometimes produced when the medicine has been neither swallowed nor given by the rectum. Thus Monro *primus* (*Works*, p. 306, 1781) tells us, that the tincture of aloes applied to a caries of the bone produced purging; and it is said (*Mém. de la Soc. Roy. de Méd. Paris*, tom. ii. p. 162) that an alòetic pill used as a stimulant to an issue had a similar effect; lastly, applied to a blistered surface, it has the same operation. So that the purgative action of aloes appears to be of a specific kind.

According to Dr. Wedekind (*op. cit.*; also, Lancet, vol. i. 1827-8, p. 347), the operation of aloes depends on the increased secretion of bile, which is produced by the specific action of this medicine on the liver. He founds this opinion on the results of various experiments. Thus he says, that if aloes be added to purgatives (a laxative infusion and sulphate of soda), whose operation is speedy, its effects do not take place for some hours after those caused by the other purgatives; and he also asserts, that the evacuations in the second purging differ from those of the first both in appearance and smell. Moreover, as long as the stools were white or gray in icterus, the aloes did not purge even when exhibited in large doses; but the purgative effect supervened immediately the fæcal matter began to contain bile, proving that the presence of bile in the intestinal canal is a necessary condition of the purgative effect of aloes. But in Moiroud's experiment above quoted, no effect seemed to be produced on the hepatic secretion.

In all probability, the increased secretion of bile, the irritation about the rectum, the disposition to hemorrhoids, and the vascular excitement of the sexual organs, all of which are said to be produced by aloes, are the effects of a stimulant action exerted by this medicine over the venous system of the abdomen, and especially of the pelvis.

Dr. Greenhow (*Lond. Med. Gaz.* vol. xix. p. 270) ascribes a diuretic effect to aloes, and his statement is corroborated by Moiroud's experiment.

Socotrine aloes is said not to be so apt to occasion hemorrhoids as the Barbadoes kind. Some years since, Dr. Clutterbuck instituted numerous experiments at the General Dispensary, Aldersgate Street, which I witnessed, to determine the effects of the different kinds of aloes, but no difference in their operation was perceptible. However, it is probable that Cape aloes is less powerful in its action on man, as on the horse, than the Barbadoes kind.

As a purgative, aloes holds an intermediate rank between rhubarb and senna. Vogt (*Pharmakodynamik*, Bd. ii. S. 334, 2[te] Aufl.) places it between jalap and rhubarb. From rhubarb it is distinguished by its more stimulant influence over the large intestines and the pelvic organs: from senna by its feebler action as a purgative, by its slow operation, and by its tonic influence when given in small doses. It irritates less powerfully than either jalap or scammony; further, its influence over the bloodvessels of the pelvic viscera is greater than these.

Use.—The uses of aloes may be readily inferred from the remarks already made. It is evidently not adapted to those cases in which a speedy effect is required; and it is, therefore, useless to add it to purgatives to quicken their operation. It is well fitted for cases of costiveness where there is a scanty secretion of bile, and for torpid conditions of the large intestines, especially when attended with deficient uterine action. Some of the ill effects ascribed to the use of aloes are probably imaginary, and others much exaggerated ("*On the Use and Abuse of Aloes*," *Lond. Med. Gaz.* vol. iv. p. 139.) It is, however, advisable to avoid the use of this purgative in inflammatory conditions and organic diseases of the liver, in biliary calculi, in mechanical impediments to the passage of the blood through the branches of the portal veins, in hemorrhage from any of the pelvic organs (as the uterus and rectum), in irritation of the rectum, prostate gland, or bladder, in pregnancy, &c. For we have many other equally efficient purgatives to the use of which, in these cases, no ill consequences have been ascribed. While, therefore, I concur with Dr. Fothergill (*Med. Obs. and Inq.* vol. v. p. 173) in advising that the exhibition of aloes should be avoided when the menses are about to cease, I am not prepared to prove that "the piles, strangury, immoderate discharges of the menses, racking pains in the loins, representing labour pains, and other similar complaints," are frequently induced by this medicine. On the contrary, I suspect this catalogue of the evils of aloetic purges to be much overcharged. "Aloetic medicines," says Dr. Denman (*Introd. to the Pract. of Midwif.*), "are forbidden during pregnancy, lest they should do mischief by their supposed deobstruent qualities; but they are cheap and conveniently given in the form of pills, and I have not observed any bad effects from them." The emaciation, stricture of the rectum, and enteritis, referred by Dr. Greenhow (*Lond. Med. Gaz.* vol. xix. p. 270) to the long continued use of aloetic medicines, ought doubtless to be ascribed to other causes.

The following are some of the cases in which the use of aloes has been advised:—

1. *In loss of appetite, and dyspepsia,* depending on a debilitated condition of the digestive organs, accompanied by costiveness, but unattended with any signs of local irritation, aloes may be given in small doses as a stomachic.

2. *In habitual costiveness,* depending on deficiency of bile, or on a sluggish condition of the large intestines—particularly in hypochondriacal or studious persons, or in those whose habits or occupations are sedentary—aloes, given in sufficient doses to purge, will be found a very useful medicine. A torpid state of the colon, with large fæcal accumulation, is not unusual in females. (Copland, *Dict. Pract. Med.* art. *Colon, torpor of*). In such the use of aloes is often attended with much benefit.

3. *To excite the menstrual discharge* aloes is frequently employed. It has been supposed that by determining an afflux of blood to the pelvic organs, aloes would stimulate the uterine vessels, and thus relieve deficient menstruation connected with atonic conditions of the uterus. But

t often fails: indeed Dr. Cullen (*Treat. of the Mat. Med.*) says that t rarely succeeds.

4. *To reproduce the hemorrhoidal discharge* aloes has been frequently employed in large doses. Serious affections of the head, or of other parts, have sometimes disappeared on the occurrence of the hemorrhoidal flux; and, therefore, in persons who have been subject to this discharge, but in whom it has stopped, it is advisable to attempt its re-establishment, with the view of relieving other more serious disorders.

5. *To promote the secretion of bile* where a deficiency of this fluid does not arise from hepatic inflammation—as in some forms of jaundice which are unconnected with biliary calculi, inflammation, mechanical obstruction of the ducts, &c.

6. *In cerebral affections.*—The compound decoction of aloes is a most valuable stimulating purgative for elderly persons in whom a tendency to apoplexy exists, especially in cold and phlegmatic habits. It will frequently be necessary to conjoin other cathartics, as the infusion of senna.

7. *As an anthelmintic,* a decoction of aloes, used as an enema, has been efficacious in the small thread-worm (*Ascaris vermicularis.*)

ADMINISTRATION.—On account of its nauseous taste, aloes is frequently given in the form of pill (*pilulæ aloeticæ*, offic.) One or two grains seldom fail to produce one stool, which seems to be merely an evacuation of what may be supposed to have been present for the time in the great intestines (Cullen). The ordinary dose is five grains; but ten, fifteen, or even twenty grains are sometimes given.

1. PILULÆ ALOËS COMPOSITÆ, L. D.; *Pilulæ Aloës*, Ed.—Aloes [hepatic, D.], powdered, ℥j.; Extract of Gentian, ℥ss.; Oil of Caraway, ♏xl.; Syrup, as much as may be sufficient, *L. D.* Beat them together until incorporated. The addition of syrup is unnecessary and improper, for the aloes and extract react on each other, and become so soft, that not unfrequently some powder is necessary to give the mass a proper consistence (Dr. Duncan, *Edinb. Dispensat.*) The Edinburgh College use equal parts of Aloes (Socotrine, fine East Indian, or Barbadoes) and Castile Soap, and a sufficiency of the Conserve of Red Roses. This pill is a valuable purgative in habitual costiveness. Dose five to fifteen grains.

2. PILULÆ ALOËS CUM MYRRHA, L. D.; *Pilulæ Aloës et Myrrhæ*, Ed.; *Pilulæ Rufi*, offic.—Aloes [hepatic, *D.* Socotrine or East Indian, *Ed.*], ℥ij. [four parts, *Ed.*]; Saffron [one part, *Ed.*], Myrrh, of each ℥j. [two parts, *Ed.*]; Syrup [Conserve of Red Roses, *Ed.*], as much as may be sufficient. Rub the aloes and the myrrh separately to powder; then beat the whole together until incorporated. Used as a purgative in chlorosis and amenorrhœa. Dose ten to twenty grains.

3. PILULÆ ALOËS ET ASAFŒTIDÆ, Ed.—Aloes (Socotrine or East Indian), Asafœtida, and Castile Soap, equal parts. Beat them, with Conserve of Red Roses, into a proper pill mass. Used in dyspepsia attended with flatulence and costiveness. Dose, ten to twenty grains.

4. PILULÆ ALOËS ET FERRI, E.—Sulphate of Iron, grs. xxxvj.; Barbadoes Aloes, grs. xxiv.; Aromatic Powder, grs. lxx.; Conserve of Red Roses, grs. c. Pulverize the aloes and sulphate of iron separately; mix the whole ingredients, and beat them into a proper mass, which is

to be divided into forty-eight pills. A valuable emmenagogue in atonic amenorrhœa and chlorosis. Dose, one to three pills.

5. *Pulvis Aloës compositus*, L. D.—Aloes [hepatic, *D.*], ℥iss.; Guaiacum Resin, ℥j.; Compound Powder of Cinnamon, ℥ss. Rub the aloes and the guaiacum resin, separately, to powder; then mix them with the compound powder of cinnamon. Purgative and sudorific. Seldom used. Dose, ten to twenty grains.

6. *Pulvis Aloës cum Canella*, D.; *Hiera Picra*, offic.—Hepatic Aloes, lb. j.; Canella bark, ℥iij. Powder them separately, and then mix. A popular emmenagogue. Dose, five to fifteen grains.

7. *Decoctum Aloës compositum*, L.D. *Decoctum Aloës*, Ed.—Extract of Liquorice, ʒvij. [℥ss. *Ed.*]; Carbonate of Potash, ʒj. [℈ii. *Ed.*]; Aloes, [hepatic, *D.* or socotrine, *Ed.*] powdered; Myrrh, powdered; Saffron, of each ʒiss. [ʒi. *Ed.*]; Compound Tincture of Cardamom, f℥vij. [f℥iv. *Ed.*]; Distilled Water, Oiss. [f℥xvi. *Ed.*] Boil down the liquorice, carbonate of potash, aloes, myrrh, and saffron, with the water, to a pint [f℥xii. *Ed.*], and strain; then add the compound tincture of cardamom. A most valuable preparation. A mild cathartic, tonic, antacid, and emmenagogue. Used in the before-mentioned cases, in doses of f℥ss. to f℥ij. Acids, acidulous salts, and most metallic salts, are incompatible with it. If it be desirable to conjoin chalybeates with it, the *Ferri Potassio-tartras*, Ph. L. (p. 555), or the *Ammoniæ Ferro-tartras* (p. 556), may be added to the cold decoction without undergoing decomposition.

8. *Extractum Aloës purificatum*, L.; *Extractum Aloës Hepaticæ*, D.—Aloes, powdered, ℥xv.; Boiling Water, Cong. j. Macerate for three days with a gentle heat; afterwards strain, and set by, that the dregs may subside. Pour off the clear liquor, and evaporate it to a proper consistence. A most unnecessary preparation. It is intended to deprive the aloes of the substance called resin, on which its irritating and griping qualities have been erroneously supposed to depend. Dose, five to fifteen grains.

9. *Tinctura Aloës*, L. D. E.—Aloes [Socotrine, *D.* Socotrine or Indian, *E.*], powdered, ℥j.; Extract of Liquorice, ℥iij.; Water, Oiss.; [Oj. and f℥vj. *E.*]; Rectified Spirit, Oss. Macerate for fourteen [seven, *D. E.* with occasional agitation, *E.*] days, and strain. The Dublin College dissolve the liquorice in ℥xvj. of water, and add f℥xvj. of proof spirit, instead of the water and rectified spirit used by the London College. This tincture cannot without difficulty and delay be prepared by percolation, *Ph. Ed.* Purgative and stomachic. Dose ʒij. to ℥j.

10. *Tinctura Aloës composita*, L. D. *Tinctura Aloës et Myrrhæ*, E. *Elixir Proprietatis*, of Paracelsus.—Aloes, [Socotrine or East Indian, *Ed.*] powdered, ʒiv.; Saffron, ʒij.; Tincture of Myrrh, Oij. Macerate for fourteen [seven, *Ed.*] days, and strain, *L.* The Dublin College omit the saffron. This tincture cannot be well prepared by percolation, *Ed.* Purgative, stomachic, emmenagogue. Used in cold, sluggish habits. Dose, ʒss. to ʒj.

11. *Vinum Aloës*, L. D. E.; *Tinctura Sacra*.—Aloes [Socotrine, *D.*] rubbed to powder, ℥ij.; Canella, powdered, ʒiv.; Sherry Wine, Oij. (Oiss. and Proof Spirit, Oj. *Wine measure*, Dub.) Macerate for fourteen

days, frequently shaking, and strain. The Edinburgh College uses Aloes (Socotrine or East Indian), ʒix.; Cardamoms, ground, and Ginger, in coarse powder, of each, gr. lxx.; Sherry, Oiss. Digest for seven days, and strain through linen or calico. Wine of aloes is purgative, in doses of f℥ss. to f℥ij.: stomachic in doses of fʒj. or fʒij.

Aloes is a constituent of several other preparations, (as *Extractum Colocynthidis compositum*, L. D., *Pilulæ Colocynthidis*, E.; *Pilulæ Rhei compositæ*, L. E.; *Pilulæ Cambogiæ*, E., *Pilulæ Cambogiæ compositæ*, L. D.; *Pilulæ Sagapeni compositæ*, L.) which will be described hereafter.

Squil'la marit'ima, Steinheil, E.—*The Sea Onion*, or *Officinal Squill.*

Scilla maritima, *Linn.* L. D.

Official

Sex. Syst. Hexandria, Monogynia.

(Bulbus recens, *L.* Bulbus, *D.* Bulb, *E.*)

History.—The Egyptians worshipped a bulbous plant, called by Lucian Κρόμμυον, and which Pauw (*Phil. Diss. on the Egypt. and Chinese*, vol. i. p. 130, 1795) asserts to be the squill, and further suggests that it was the red variety (? *Squilla Pancration* var. α. *Bulbo rufo*, Steinh.) Pythagoras (Pliny, *Hist. Nat.* lib. xix. cap. 30) is said to have written a volume on the medicinal properties of squill, and to have invented the *acetum scillæ*. Hippocrates employed squill (σκίλλα) internally (*De victus ratione*), externally (*De ulceribus*), and as a pessary (*De Nat. Mul.*)

Botany. *Gen. Char.*—*Sepals* three, coloured, spreading. *Petals* very like them, and scarcely broader. *Stamens* six, shorter than the perianth; *filaments* smooth, somewhat dilated at the base, acuminate, entire. *Ovary* three-parted, glandular and melliferous at the apex; *style* smooth, simple; *stigma* obscurely three-lobed, papillose. *Capsule* rounded, three-cornered, three-celled. *Seeds* numerous, in two rows, flattened with a membranous testa. (*Lindley*, from Steinheil.)

Sp. Char.—*Leaves* very large, subsequently spreading. *Bracts* long. *Flowers* white; flower-bud somewhat acute. *Anthers* yellow. *Ovarium* thick, yellowish. *Bulb* very large (*Steinheil, Ann. Sc. Nat.* t. vi. p. 272, 2de Sér.)

Bulb roundish-ovate, half above ground. The *leaves* appear after the flowers; they are broad, lanceolate, twelve to eighteen inches long. *Scape* about two feet high, terminated by a dense long raceme.

Hab.—Shores of the Mediterranean, viz. Spain, France, Sicily, Africa, &c. Navarino has long been celebrated for its squills. In its native soil the plant flowers about August.

Description.—The fresh bulb (*bulbus recens*, L.; *radix recens*, offic.) is pyriform, of the size of the fist to that of a child's head, and is composed of thick, fleshy, smooth, shiny scales, attenuated at their edges, closely applied over each other, and attached to a conical disk (a rudimentary stem), which projects inferiorly, and gives origin to the root fibres, the remains of which are to be frequently found in the bulbs of commerce. The outer scales are usually dry, thin, coloured, membranous, or papery. By cracking the inner or fleshy scales, numerous spiral vessels may be drawn out. On submitting the cuticle of the scales to a microscopic examination, numerous acicular crystals (*raphides*) are perceived in cells, which are distinguished from the surrounding angular cells, by being larger and elliptical. The *pulvis scillæ*, offic. contains nine or ten per cent. of these crystals.

Two kinds of squills, both abounding in an acrid juice, and having a very bitter taste, are met with in commerce; viz. the *white* (*squilla alba*), and the *red* (*squilla rubra*), both of which are so called from the colour of the scales. (Is the red kind the *Squilla Pancration* var. *a. Bulbo rufo*, Steinheil?) The white is preferred in England.

In the London Pharmacopœia the fresh bulbs are directed to be preserved in dry sand; and, before drying them, the dry rind is to be removed; they are then to be cut transversely in thin slices, and dried as quickly as possible with a gentle heat.

Dried squill (*radix scillæ siccata*, offic.) is, however, for the most part imported, in consequence of the duty being no higher for this than for the recent bulb. It occurs in white or yellowish-white, slightly diaphanous pieces, which, when dry, are brittle, but when moist are readily flexible. As their affinity for moisture is great, they should be preserved in well-stoppered bottles, or in a very dry place.

Squill is imported from Malta, and other countries of the Mediterranean. Also from Petersburg and Copenhagen (*Trade List*, Sept. 11, and Nov 20, 1838).

Composition.—The more recent analyses of squill are those of Vogel, in 1812, (*Ann. de Chim.* t. 83, p. 147), and of Tilloy, in 1826 (*Journ. de Pharm.* xii. p. 635). Buchner, in 1811 (*Berl. Jahrb.* xv. p. 1), examined the juice of the fresh bulb.

Vogel's analysis of Squills, dried at 212° F.

Scillitin with some sugar ..	35
Tannin	24
Gum......................	6
Woody fibre, and some citrate (and perhaps tartrate) of lime	30
Acrid volatile matter	
Loss......................	5
Squill bulb	100

Tilloy's Analysis of dried and fresh Squills.

Acrid bitter resinous extractive (*Scillitin*).
Uncrystallizable sugar.
Gum.
Fatty matter.
Piquant, very fugaceous matter.
Squill bulb.

Buchner's Analysis of fresh Squill bulb juice.

Peculiar bitter extractive..	9·47
Mucilage	3·09
Gelatinous matter (*Traganthin?*)	0·94
Phosphate of lime	0·31
Fibrous matter	3·38
Water....................	79·01
Astringent acid..........	traces
Loss	4·40
Squill juice..............	100·60

Acrid, volatile? matter.—It is well known that squill, in the recent state, is very acrid; and, when applied to the skin, causes irritation, inflammation, and even vesication. By drying, the greater part of this acridity is got rid of; and hence the acrid principle is usually described as being of a volatile nature, and, in confirmation of its volatility, Athanasius (Pfaff, *Mat. Med.* Bd. v. S. 188) states, that two ounces of water distilled from fresh squills caused the death of a dog in six hours. However, by others, its volatility is denied; and Vogel says, that six ounces of water distilled from fresh squills had no effect on dogs. Buchner (*Toxikologie*, 340) states, that besides the bitter scillitin, squill contains, according to his experiments, another principle, which is combined with phosphate of lime, and which is capable of exciting itching and inflammation. This acrid matter, says he, may be easily decomposed, but it is not volatile, as is generally supposed.

Scillitin (*Scillitite*, Thomson).—The substance to which Vogel gave the name of Scillitin is a whitish transparent deliquescent substance, which, when dry, has a resinous fracture, and may be easily rubbed to powder. Its taste is bitter, and subsequently sweetish. It readily dissolves in water, spirit of wine, and acetic acid. The substance sold in the shops under the name of Scillitin is a thick treacle-like liquid. Landerer (Thomson's *Org. Chem.* p. 717) obtained crystals of Scillitin. He says they possessed alkaline properties.

Raphides (*phosphate of lime?*) The acicular crystals found in the cuticle of the scales of the bulb, as before mentioned, probably consist of phosphate of lime. These perhaps are the needle-like crystals obtained by Vogel by evaporating the juice of the bulb, and which he regarded as citrate of lime.

Chemical Characteristics.—An aqueous decoction of squills is pale, and very bitter. Sesquichloride of iron communicates an intense purplish blue colour (*gallate of iron*) to it. Gelatin has scarcely any effect on it. Nitrate silver forms a white precipitate (*chloride of silver*) soluble in ammonia, but insoluble in nitric acid. Oxalate of ammonia renders the decoction turbid, and after some time causes a white precipitate (*oxalate of lime.*) Diacetate of lead and protonitrate of mercury form precipitates in the decoction. Tincture of nutgalls has no effect on it. Starch is not recognizable in it by iodine. Alkalies heighten the colour of the decoction.

Physiological Effects. (*a.*) *On vegetables.*—Not ascertained.

(*b.*) *On animals.*—An ounce of powdered squill acts as a diuretic on horses and other larger animals; the same effect is produced on smaller animals by half a drachm (Moiroud, *Pharm. Vétér*). When the dose is large, squill acts as a poison. It first causes local irritation; then its active principle becomes absorbed, affects the nervous system, and thereby quickens the respiration, causes convulsions and death (Orfila, *Toxicol. Gén.*) Hillefeld (*Marx, Die Lehre von d. Giften*, vol. ii. S. 26,) mentions paralysis produced in a rabbit by nineteen grains of powdered squill. Emmert and Hoering (Meckel's *Archiv*, B. 4, Heft 4, S. 527) state that squill juice, introduced into the abdominal cavity, became absorbed.

(*c.*) *On man.*—*In small doses* it acts as a stimulant to the excretory organs. Thus it promotes secretion from the mucous membranes (especially the bronchial and gastro-intestinal) and the kidneys. Its most marked effect is that of a diuretic. Its expectorant effects are less obvious and constant. Sometimes, when it fails to act on the kidneys, it increases cutaneous exhalation. Its influence on secreting organs is probably to be referred to the local stimulus communicated to their vessels by the active principle of squill in its passage out of the system, for Emmert and Hoering (*op. cit.*) have shewn that the juice is absorbed, so that squills may be regarded as an acrid even for these remote parts. When it proves diuretic in dropsies, it usually promotes the absorption of the effused fluid—an effect which is, I think, indirect, and a consequence of the diuresis. But Sundelin (*Handb. d. Sp. Heilm.* Bd. ii. p. 17) observes of squill, that it promotes the secretion of urine less by its local irritation of the kidneys, than by its general excitement of the absorbent apparatus.

By the continued use of squill in gradually increased doses, it disturbs the functions of digestion and assimilation.

In full medicinal doses, squill excites nausea and vomiting. Purging, also, is not unfrequently produced. When squill proves emetic or purgative, its diuretic operation is much less obvious—a circumstance which Cullen (*Treat. of the Mat. Med.* p. 557) refers to the squill being prevented reaching the blood-vessels and kidneys. Home (*Clinical Experiments*, p. 387, 1783, 3d ed.), however, alleges that the diuretic effects are not to be expected unless there be some operation on the stomach. But the operation on the stomach may be, as Cullen suggests, a mere test of the activity of the squills. However, that the effect of squill, in strong doses, is not confined to the alimentary canal, is proved by the fact, that when the vomiting and purging were present, the pulse has been observed to be reduced in frequency, often to forty beats per minute (Home).

In excessive doses, squill acts as a narcotico-acrid poison, and causes vomiting, purging, griping pain, strangury, bloody urine, convulsions, inflammation and gangrene of the stomach and intestines (Murray, *App. Med.* vol. v. p. 97). Twenty-four grains of the powder have proved fatal (Vogel, *Journ. de Phys.* lxxv. 194).

Considered with reference to its diuretic effect, squill is comparable with foxglove. But it exceeds the latter in its stimulant influence over the urinary organs. On the other hand, foxglove is characterized by its powerfully sedative effect on the vascular system; for though squill has, in some instances, reduced the frequency of the pulse, this effect is by no means common. Squill, says Vogt (*Pharmakodyn.* ii. 343, 2te Aufl.), preponderates in its action on the inferior or vegetative [organic] life; foxglove on the other hand, in its action on the higher or animal life.

Uses.—The principal uses of squill are as an emetic, diuretic, and expectorant.

1. *As a diuretic in dropsies.*—It is applicable to those cases of dropsy requiring the use of stimulating or acrid diuretics, and is improper in inflammatory cases. It is an unfit remedy for dropsy complicated with granular kidney or vesical irritation; but when these conditions are not present it is adapted for torpid leucophlegmatic subjects. Hence, it is more serviceable in anasarca than in either ascites or hydrothorax. It should be given so as to excite a slight degree of nausea (not vomiting), as recommended by Van Swieten (*Comment. upon Boerhaave's Aphorisms,* vol. xii. p. 435). By this means its absorption is promoted. The acetate or bitartrate of potash may be conjoined. Calomel is usually regarded as a good adjunct for promoting the diuretic influence of squill. When it does not purge it is beneficial, but its tendency to affect the bowels is an objection to its use.

2. *As an expectorant in chronic pulmonary affections* admitting of the use of a substance stimulating the capillary vessels of the bronchial membrane. Thus, in chronic catarrh, humid asthma, and winter cough, it is often employed with considerable benefit. It is of course improper in all acute cases accompanied with inflammation or febrile disorder. In old persons it is often combined with the *tinctura camphoræ composita,* and with good effect. The oxymel or syrup of squill may be given to relieve troublesome chronic coughs in children.

3. *As an emetic* it is occasionally used in affections of the organs of respiration requiring or admitting of the use of vomits. Thus, the oxymel is given, with the view of creating sickness and promoting expectoration, to children affected with hooping-cough; and sometimes, though with less propriety, in mild cases of croup. The great objection to its use is the uncertainty of its operation: in one case it will hardly excite nausea, in another it causes violent vomiting. Furthermore, it is of course highly objectionable as an emetic for delicate children with irritable stomachs, on account of its acrid properties, and the irritation it is capable, in these cases, of setting up.

Administration.—The following are the preparations of squills usually employed:—

1. *Pulvis Scillæ,* D. L.—The directions of the Dublin College for the preparation of this are, as follows:—Remove the membranous inte-

uments from the bulb of the squill, cut it into slices, and dry with an nferior heat (between 90° and 100° F.); then reduce them to powder, which ought to be kept in glass bottles with ground stoppers. The bulb oses about four-fifths of its weight by drying: so that six grains of he dry powder are equal to half a drachm when fresh. Powdered quill readily attracts water from the atmosphere, and becomes soft and nouldy; hence the necessity of preserving it in stoppered bottles and in . dry place. It is usually administered in the form of pill. The dose of he powder, as an emetic, is from six to fifteen grains: ten grains being he average. As an expectorant or diuretic we should commence with ne grain and gradually increase until slight nausea is excited.

2. *Pilulæ Scillæ compositæ*, L. D. *Pilulæ Scillæ*, Ed.—Squill, resh dried and powdered, ʒj.; Ginger, powdered; Ammoniacum, powlered, each ʒij.; Soap, ʒiij.; Syrup [Molasses, *D.*] as much as may e sufficient. Mix the powders together; then beat them with the oap, and add the syrup [molasses, *D.*] so as to obtain a proper consisence. The Edinburgh College takes of powdered Squill grs. xxiv., owdered Ammoniac, and Ginger, and Spanish Soap, each ℈j.; Conserve f Red Roses, gr. x.; and forms them into twenty-four pills. Expectorant nd diuretic. Principally used in chronic bronchial affections. Dose rom five to twenty grains. It readily spoils by keeping.

3. *Tinctura Scillæ*, L. D. E.—Squill, fresh dried, ℥v. [bruised into oarse powder, ℥iv. *Ed.*]; Proof Spirit, Oij. [Oj. and f℥xij. *Ed.*]; macerate for fourteen days, and strain, *L.* The directions of the Dublin College do not essentially differ from these. "Prepare this tincture by percolation, as directed for tincture of cinchona, but without packing the pulp firmly in the percolator. It may likewise be obtained by the proress of digestion from the sliced bulb." *Ed.* Expectorant and diuretic. Used in chronic bronchial affections. Dose ♏x. to f℥ss.

4. *Acetum Scillæ*, L. D. E.—Squill, fresh dried, ℥xv. [℥viij. *D.*]; Distilled Vinegar, Ovj. [Oiii. *D. wine meas.*] Proof [rectified, *D.*] Spirit, Oss. [f℥iv. *D.*] The relative proportions used by the Edinburgh College are the same as those of the London College, except that one-tenth ess spirit is employed. Macerate the squill with the vinegar, with a gentle heat, in a covered vessel, for twenty-four hours [seven days, *D. Ed.*]; afterwards press out [the liquor] and set it by, that the dregs may subside: lastly, add the spirit to the clear liquor. A most ancient preparation. Expectorant and diuretic. Used in chronic pulmonary affections and dropsies under the regulations before described. Dose ʒss. to ʒiss. in some aromatic water. It is a constituent of the *Mistura Cascarillæ composita*, Ph. L.

5. *Oxymel Scillæ*, L. D.—Honey [despumated] lb. iij.; Vinegar of Squill, Oiss. Boil down in a glass vessel, with a slow fire, to a proper consistence. Used as an expectorant in chronic catarrhs and asthma, in doses of fʒj. or fʒij. As an emetic it is sometimes given to children affected with hooping-cough or croup, in doses of a teaspoonful repeated every quarter of an hour until vomiting occurs.

6. *Syrupus Scillæ*, E.—Vinegar of Squills, three pints; Pure Sugar, seven pounds. Dissolve the sugar in the vinegar of squills, with the aid of a gentle heat and agitation. Use and dose as the oxymel.

Antidote.—No antidote is known. The first object, therefore, in a case of poisoning, is to evacuate the stomach; the second, to allay the inflammatory symptoms which may supervene.

Al'lium sati'vum, Linn. L. E. D.—*Common* or *Cultivated Garlic.*

Sex. Syst. Hexandria, Monogynia.

(Bulbus *L. D. E.*)

History.—This plant was well known to the ancients. The Greeks called it σκόροδον. It was used by Hippocrates.

Botany. *Gen. Char.*—*Flowers* umbellate, with a membranous *spathe. Perianth* six-parted, permanent, equal. *Stamens* inserted into the base of the perianth; *filaments* either all alike, or every other one tricuspidate, with the *anther* on the middle point. *Style* subulate; *stigma* simple. *Capsule* usually obtusely three-cornered or three-lobed, depressed, three-celled, bursting into three valves through the dissepiments, and containing two or one black angular seed in each cell. (*Lindley.*)

Sp. Char.—*Bulb* surrounded by smaller ones. *Leaves* linear, entire. *Umbel* bulbiferous, globose. *Spathe* ovate, rounded. *Segments of the perianth* ovate, obtuse. *Pistil* and *stamens* exsert, (Decandolle, *Bot. Gall.*) *Stem* about two feet high. *Flowers* whitish.

Hab.—? South of Europe. ? Egypt. ? Persia. Cultivated in kitchen gardens. It flowers in July.

Description.—The *bulb*, E. [*bulbus*, L. D.], is composed of *cloves*, each furnished with its proper envelopes. Its odour is strong, irritating, and characteristic: its taste is acrid.

Composition.—Cadet (Gmelin, *Handb. d. Chem.* ii. 1336) analyzed garlic. He found the constituents to be *acrid volatile oil, extractive* (a little), *gum, woody fibre, albumen,* and *water.* The ashes contained alkaline and earthy salts. Bouillon-Lagrange has detected, besides these, *sulphur, starch,* and *saccharine matter,* (*Journ. de Pharm.* t. ii. p. 358.)

Oil of garlic has a very acrid taste, a strong smell, and yellow colour. It is heavier than water, and is soluble in alcohol. It contains sulphur, and hence, in burning, produces sulphurous acid. According to Cadet, 20 lbs. of garlic yielded only six drachms of essential oil. It strikes a black colour when rubbed with oxide of iron. It is a powerful irritant, and when applied to the skin causes irritation. The Hindoos, according to Dr. Ainslie, (*Mat. Indica,* i. 151) prepare a stimulating expressed oil from garlic, which they give internally in ague, and use externally in palsy and rheumatism.

Physiological Effects.—Garlic is a local irritant. Swallowed it operates as a tonic and stimulant to the stomach. Its volatile oil becomes absorbed, quickens the circulation, occasions thirst, and is thrown out of the system by the different excretories; the activity of which it promotes, and to whose excretions it communicates its well-known odour. Large doses occasion nausea, vomiting, and purging. Puihn (quoted by Wibmer, *Die Wirk. d. Arzneim*) says the expressed juice has proved fatal.

Uses.—Employed by the cook as a flavouring ingredient in various made dishes, sauces, &c. Rarely used by the medical practitioner. Internally it has been exhibited as a stimulant and stomachic in enfeebled digestion; as an expectorant in old chronic catarrhs; as a diuretic in atonic dropsies; and as an anthelmintic. Externally it has been employed as a resolvent in indolent tumors; as a local irritant or rubefacient applied to the feet to cause revulsion from the head or chest; as an antispasmodic liniment (composed of oil and garlic juice) in infanile convulsions; as a remedy for some cases of deafness, a clove or a ew drops of the juice being introduced into the ear.

Administration.—A clove may be swallowed either entire, or, more conveniently, cut into small pieces. The dose of the fresh bulbs is one or two drachms. The expressed juice mixed with sugar, the infusion of garlic, and a syrup, are sometimes employed.

Al'lium Ce'pa, Linn. D.—*The Onion.*

Sex. Syst. Hexandria, Monogynia.

(Bulbus, *D.*)

History.—The onion was known and used in the most ancient times. It was employed in medicine by Hippocrates. An onion taken from the hand of an Egyptian mummy, perhaps 2000 years old, has been made to grow (Müller's *Physiol.* by Baly, vol. i. p. 29).

Botany. *Gen. Char.*—Vide *Allium sativum.*

Sp. Char.—*Stem* fistulous, ventricose beneath; longer than the terete, fistulous *leaves. Umbel* capsuliferous, globose. *Segments of perianth* linear-elliptic, obtuse; shorter than the stamens and pistil. (*Bot. Gall.*) Biennial. *Flowers* whitish. July.

Loudon (*Encycl. of Gard.*) enumerates eighteen varieties deserving of culture.

Hab.—Egypt. Cultivated in kitchen gardens.

Description.—The bulb (*bulbus*, D.) is tunicated. When cut, it evolves an acrid principle, having a well-known odour, and a powerful action on the eyes, causing a flow of tears. Its taste is sweet and acrid.

Composition.—According to Fourcroy and Vauquelin (*Ann. Chim.* lxv. 161, 1808) the onion contains *an acrid volatile oil, uncrystallizable sugar, gum, woody fibre, albumen, acetic* and *phosphoric acids, phosphate* and *citrate of lime*, and *water.*

The volatile oil of onions is acrid, piquant, colourless, and, like that of garlic, contains sulphur.

Onion juice is colourless, but by exposure to the air becomes reddish.

Physiological Effects.—Analogous to those of garlic, but milder. By boiling onions, the volatile oil is dissipated, and the bulb is deprived of its irritating qualities, and becomes a mild esculent substance.

Uses.—Extensively used as an article of food and as a condiment. It is very rarely employed in medicine, but is adapted to the same cases as garlic. Raw onions are occasionally taken as an expectorant, with advantage, by elderly persons affected with winter cough.

Administration.—A roasted onion is sometimes employed as an emollient poultice to suppurating tumors, or to the ear to relieve ear-ache. The expressed juice has been given to children, mixed with sugar, as an expectorant.

Other Dietetical, Medicinal, or *Poisonous Liliaceæ.*

The *Crown Imperial* (*Fritilla'ria Imperia'lis*) is a narcotic poison (Brandt and Ratzburgh, *Giftgewächse*). Orfila (*Tox. Gén.*) could not recognise any acridity in it.

The recent bulb of the *Common White Lily* (*Lil'ium can'didum*) has been used as a diuretic in dropsies. The boiled bulb is employed as an emollient cataplasm.

Various species of *Allium*, besides those already mentioned, are cultivated for culinary purposes: as, *A. Por'rum, the Leek; A. ascalon'icum, the Shallot; A. Schæno'prasum, the Chive; A. Scorodo'prasum* or *Rocambole.* Their virtues are analogous to those of the onion and garlic.

FIG. 116.

Xanthorrhœa arborea.

Squil'la Pancra'tion, Steinh. (Παγκράτιον, Dioscorides) is said by Steinheil to yield a small bulb of a reddish colour, found in commerce under the name of squill.

The root of *Ale'tris farino'sa* is used in the United States as a tonic. *Erythro'nium america'num* is emetic (Wood and Bache, *United States Dispensatory.*)

The fresh rhizome of *Solomon's Seal* (*Convalla'ria Polygona'tum*) is a popular application to bruised parts (the eye for example), to remove the marks.

Xanthor'rœa hasti'le and *X. arbo'rea*, natives of New Holland, yield resinous substances. That obtained from the first species somewhat resembles gamboge, and is called *yellow gum* [resin] *of New Holland.* It has been described by Mr. Kite (*Essays and Observ.*), who used it in several diseases. More recently Dr. Fish (Dierbach, *Neuest Entd. in d. Mat. Med.* from the *Boston Journ.* vol. x.) has used it in the form of tincture, with opium, in *fluxus hepaticus* and diarrhœa. Mr. Johnston (Abstr. of *Phil. Trans.* for June 20, 1839) says, this resin contains more oxygen than any other resinous substance hitherto analysed. Its composition is $C^{40} H^{20} O^{12}$. A red resin, probably from *X. arborea* (fig. 116), has been recently imported under the name of *black-boy gum.*

FIG. 117.

Dracæna Draco.

The young shoots of *Aspa'ragus officina'lis* are well-known articles of food. They are diuretic, and communicate a peculiar odour to the urine. *Asparamide* (formerly called *asparagin*) is contained in this plant. Its composition is $C^8 H^5 N O^5 + N H^2$.

Dracæ'na Dra'co (fig. 117), a native of the Canary Islands and of the East Indies, yields a substance called Dragon's blood. One of these trees growing at Orotava has long been celebated for its great size and age. Next to the Baobab trees (*Adansonia digitata*), it is regarded as one of the oldest inhabitants of the earth (Humboldt, *Tabl. de la Nature*).

Order 13. Smila'ceæ, *Lindl.*—The Smilax Tribe.

Essential Character.—*Flowers* hermaphrodite or diœcious. *Calyx* and *corolla* confounded, inferior six-parted. *Stamens* six, inserted into the perianth near the base; seldom hypogynous. *Ovary* three-celled, the cells one, or many seeded; *style* usually trifid; *stigmas* three. *Fruit* a roundish berry. *Albumen* between fleshy and cartilaginous; *embryo* usually distant from the hilum. *Herbaceous* plants or *under shrubs*, with a tendency to climb. *Stems* woody. *Leaves* reticulated. (*Lindley.*)
Properties.—Those of Smilax are alone known.

Smi'lax, Linn.—*Several species yielding Sarsaparilla.*

Sex. Syst. Diœcia, Hexandria.

(Radix dicta Sarza seu Sarsaparilla.)

History.—Sarsaparilla first appeared in Europe in 1530, and was employed as an antivenereal remedy (Voigtel, *Mat. Med.* Bd. i. S. 117.) The Spanish term *Zarzaparilla* (from *zarza* a bramble, and *parilla* a vine) signifies a thorny vine.

Botany. — *Gen. Char.*—*Diœcious. Perianth* six-parted, nearly equal, spreading. *Male flowers: stamens* six; *anthers* erect. *Female flowers: perianth* permanent; *ovary* three-celled, the cells one-seeded; *style* very short; *stigmas* three. *Berry* one to three-seeded. *Seeds* roundish; *albumen* cartilaginous: *embryo* remote from the hilum. (R. Brown, *Prodromus*, p. 293.)

Species.—The following species yield at least part of the sarsaparilla of commerce.

1. *Smilax officinalis*, Kunth, Lond. Ed.—*Stem* twining, shrubby, prickly, quadrangular, smooth; the young shoots are unarmed and almost round. *Leaves* ovate-oblong, acute, cordate, netted, five to seven-nerved, coriaceous, smooth, a foot long, and four to five inches broad; the young ones are narrow, oblong, acuminate, and three-nerved. *Petioles* smooth, an inch long, bearing two tendrils above the base. *Flowers and fruit* unknown. Grows in New Granada, on the banks of the Magdalena, near Bajorque. This is called *Zarzaparilla* by the natives, who transmit large quantities to Carthagena and Mompox; whence it is shipped for Jamaica and Spain. (Humb. *Nov. Gen. et Spec.* i. p. 215.) It is probably the source of *Jamaica*, and perhaps also of *Lima* and *Honduras sarsaparillas.*

2. *Smilax medica*, Schlecht.—*Stem* angular, armed at the joints with straight prickles, with a few hooked ones in the intervals. *Leaves* shortly acuminate, smooth, five to seven-nerved; inferior ones, cordate, auriculate-hastate; upper ones cordate-ovate. *Peduncle* axillary, smooth, about an inch long. *Inflorescence* an eight to twelve-flowered umbel. *Fruit* red, size of a small cherry; contains one to three reddish-brown *seeds. Embryo* cylindrical, lodged in horny albumen (T. F. L. Nees, *Pl. Med. Suppl.*) Schiede found it on the Eastern slope of the Mexican Andes. It is carried from the villages of Papantla, Taspan, Nautla, Misantla, &c. to Vera Cruz, under the name of *Zarzaparilla*, and is there introduced into the European market. The roots are gathered all the year long, dried in the sun, and then tied in bundles for sale (*Linnæa*, iv. 576, quoted from Lindley's *Fl. Med.*) This species yields *Vera Cruz sarsaparilla.*

3. *Smilax siphilitica*, Willd.—*Stem* round, strong, with two to four straight prickles at the knots. *Tendril* long, attached to the apex of

the stipules. *Leaves* oblong-lanceolate, three-nerved, coriaceous, smooth, and shining. Humboldt and Bonpland discovered it in New Granada, on the river Cassiquiare, between Mandavaca and San Francisco Solano (*Nova Gen. et Sp. Plant.* t. i. 271). Von Martius (*Reise in Brasilien*, Bd. iii.) found it in the Brazils at Yupurá and Rio Negra. It yields *Brazilian sarsaparilla*

4. *Smilax Sarsaparilla*, Linn.—*Stem* prickly, somewhat quadrangular. *Leaves* ovate-lanceolate, cuspidate, almost five-nerved, beneath glaucous (*Willdenow*). It is a native of Virginia, and other southern states of the American union. There is no evidence that it yields any of the sarsaparilla of the shops. Yet Th. Martius (*Pharmakognosie*) ascribes the Vera Cruz variety, which, he says, sometimes comes over under the name of American sarsaparilla, to it.

Description.—The roots of the preceding, and perhaps of other species, constitute the *Sarsaparilla* or *Sarza* of the shops. These are imported, made up in bundles, formed either of the spirally folded roots (*sarsaparilla rotunda*), as in the Jamaica and Lima varieties, or of unfolded parallel roots (*sarsaparilla longa*), as in the Lisbon variety. Attached to the roots are, in some varieties (as the Lima and Vera Cruz kinds), portions of the rhizome and aerial stem: these constitute what druggists call the *chump*. On the aerial stem are frequently found the *aculei* or *prickles*.

The roots are usually several feet long, about the thickness of a writing quill, wrinkled more or less longitudinally, with root-fibres in greater or less abundance attached to them. Their colour varies, being more or less red or brown, frequently with a grayish tint. Greater or less care in drying, time of year when collected, soil, and many other circumstances, doubtless modify the colour. The taste of the root is mucilaginous, and slightly acrid. The acridity is only perceived after chewing the root for a few minutes. The odour is somewhat earthy.

The radix or runners are composed of two parts, the *cortex* and *meditullium*. (*Vide* figs. 118 and 119.) The *cortex* consists of—1st, the *cuticle* or *epidermis*; 2dly, a layer of elongated cellular tissue, which I shall call the *subcuticular tissue*; 3dly, a layer of *hexagonal cellular tissue*. The last-mentioned layer is red in Jamaica sarsaparilla; but in the Honduras variety it is thick, white, and amylaceous. The *meditullium* consists of—1st, a ring of elongated cellular tissue analogous to the subcuticular tissue; 2dly, a *woody zone*, composed principally of reticulated ducts; 3dly, a central tissue analogous to *medulla* or *pith*, consisting of hexagonal cellular tissue, which frequently abounds in starch. The apertures seen in the woody zone, on a transverse section of the root, are the cut extremities of ducts. In structure, then, sarsaparilla root much resembles an exogenous stem, except that it has no medullary rays. The starch globules are small, and are frequently united in masses of three or four; when of four, the masses have a tetrahedral form.

Quality.—It is not easy to lay down criteria of the goodness of sarsaparilla; for, on the one hand, in the absence of a correct knowledge of the active principle of this root, we have no chemical tests on which we can rely; and, on the other hand, the immediate and obvious effects of sarsaparilla are so slight that we are unable to ascertain by experience the relative value of different samples. In the drug trade, Jamaica sarsaparilla is esteemed the best; but though I do not doubt the correctness of this opinion, I confess I am unacquainted with any accurate comparative experiments on which it is founded.

The *colour* of the root is not to be absolutely depended on; but roots having a deep orange-red tint are preferred. *Taste* perhaps is the best criterion: the more acrid and nauseous the taste, the better is the quality of the root. This test has been much insisted on by Dr. Hancock (*Trans. Med.-Bot. Soc.* 1829). Many druggists prefer *mealy* sarsaparilla, that is, sarsaparilla whose cortex is brittle and powdery, and which, on being fractured transversely, throws out a white dust. But this quality, which is so obvious in Honduras sarsaparilla, depends on the presence of starch; and, instead of being a test of goodness, is to be regarded as the reverse. The *quantity* of *extract* yielded by a given weight of the root has been much depended on by Mr. Battley and Mr. Pope as a test of goodness: both these writers have asserted the superiority of Jamaica sarsaparilla, because it yields a larger quantity of extract. But though a sarsaparilla which yields very little extract cannot be regarded as good, yet it does not follow, especially in the absence of comparative trials, that a sarsaparilla which yields the most abundant extract is necessarily the best, since the quantity may arise from the presence of mucilage and other inert matters. The *beard* is another criterion of goodness: the greater the quantity of root fibres (technically called *beard*) the better the sarsaparilla.

1. *Jamaica Sarsaparilla*, offic. *Red-bearded Sarsaparilla* (*Radix sarzæ jamaicensis.*) The roots are folded and made up into bundles (*sarsaparilla rotunda*) of about a foot or half a yard long, and four or five inches broad. These bundles are neither trimmed nor closely packed. They consist of long, slender runners, furnished with numerous small, fibrous rootlets (called the *beard*). Its cortex is brownish, but with an orange-red tint, which distinguishes this from other kinds of sarsaparilla, and has given rise to its name of *red* sarsaparilla. The cortex is reddish, and when examined by the microscope is found to contain some starch globules. The meditullium has frequently a reddish tint. When chewed, Jamaica sarsaparilla tinges the saliva. Its taste is not remarkably mucilaginous, but slightly bitter, and after a few minutes slightly acrimonious. Its decoction is deepened in colour by a solution of iodine; but no blue is perceptible. Its powder is pale reddish brown, and when rubbed with water and tincture of iodine becomes blue, but less intensely so than the powder of the Honduras variety. It yields a larger quantity of extract than the other varieties: its extract is perfectly soluble in cold water. From three pounds of average quality about one pound of extract may be obtained (Hennell; also Battley); but from the same quantity of root of very fine quality, nearly one pound and a quarter of extract may be procured (Hennell). 874 grains of the cortical portion of the root yielded 484 grains of extract (Battley).

FIG. 118.

Magnified view of a section of Jamaica Sarsaparilla.

a, Cuticle.
b, Subcuticular tissue.
c, Hexagonal cellular tissue.
d, Cellular ring.
e, Woody zone.
f, Medulla.

According to Mr. Pope, the cortex yields five times as much extract as the meditullium.

Jamaica sarsaparilla is not the produce of the island whose name it bears, but, as I am informed, of the Mosquito shore on the eastern coast of Honduras and of St. Juan, from whence it is brought to England by way of Jamaica. Occasionally it is brought from Guatemala.

In the collection of Materia Medica at Apothecaries' Hall, London, is a sample of sarsaparilla grown in Jamaica. Its colour is pale cinnamon brown. Internally it is mealy. Jamaica sarsaparilla is perhaps the root of *Smilax officinalis*.

2. *Brazilian Sarsaparilla: Lisbon, Portugal,* or *Rio Negro Sarsaparilla* (*Radix Sarzæ braziliensis*). This is usually exported from Maranham. It is brought over unfolded, tied in cylindrical bundles (*sarsaparilla longa*) of from three to five feet long, and about a foot in diameter. It is free from *chump*. It has fewer longitudinal wrinkles than the Jamaica kind, fewer radicles, especially at one end; has a reddish-brown colour, and abounds in amylaceous matter, both in the cortex and pith. Its decoction is much paler coloured than the Jamaica variety.

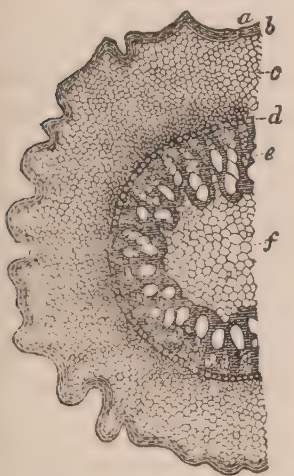
Martius (*Reise*, Bd. iii. S. 1280) says it is the produce of *Smilax siphilitica*, and is gathered all the year round. After being dried over a fire, the roots are tied up in bundles with a flexible stem called *Timbotitica;* and to prevent them being worm-eaten, they are preserved in the gables of the houses, where they are exposed to smoke. Dr. Hancock (*Trans. Med.-Bot. Soc.* 1829) has denied that the "Rio Negro Sarsa" is the produce of *S. siphilitica*, because he found no auxiliary spines on a portion of stem adhering to the roots, and Dr. Lindley (*Fl. Medica*, p. 597) has admitted the correctness of the inference. But until we know the extent of stem examined, we are not authorised, I conceive, to adopt Dr. Hancock's conclusion; for in the same bale of apparently the same kind of sarsaparilla, we frequently find portions of stem (not exceeding three or four inches in length), some of which have prickles, others are without them, and there is not the least ground for presuming them to have been procured from different species. Professor Guibourt, who has described (*Hist. des Drog.* i. 578) a second kind of Caraccas sarsaparilla as devoid of prickles, tells me he has since met with them in other samples of the same kind of sarsaparilla.

3. *Lima Sarsaparilla* (*Radix Sarzæ de Limâ*).—Originally imported from Lima, but is now frequently brought from Valparaiso, and sometimes from Costa Rica. I know of one importation of 99,000 lbs. from the latter place. It has a close resemblance to Jamaica sarsaparilla, for which I am told it is extensively sold, but it yields a smaller quantity of extract. It is imported folded (*sarsaparilla rotunda*) in bundles of about three feet long, and nine inches in diameter, with the attached *chump* contained in the interior of the bundle. Its colour is brown or grayish brown. Occasionally a few roots are found in a bale of good Lima sarsaparilla, which, as well as their rhizome and stem, are light clay-coloured. The stems are square, and prickly; the prickles are few and small, except in the clay-coloured variety. It is probably the produce of *Smilax officinalis*.

Occasionally a knobby root, (*rhizome?*) like the *radix Chinæ*, with a round stem, and long, smooth, wiry, brown root-fibres, is found in a bale of Lima sarsaparilla. A transverse section of the stem presents, to the naked eye, a structure somewhat similar to that of the common cane. I have received the same root (under the name of *Salsepareille-Squine de Macaraïbo*) from Professor Guibourt, who found it in Caraccas sarsaparilla.

4. *Honduras Sarsaparilla; Mealy Sarsaparilla* (*Radix Sarzæ Honduras*). Is imported from Belize and other ports of the Bay of Honduras. The roots are folded and formed into bundles (*sarsaparilla rotunda*), two or three feet long, in the interior of which are found roots of inferior quality, stones, clumps of wood, &c. The roots or runners are furnished with but few rootlets. The colour is dirty or grayish brown. The cortex consists of a thin epidermis, within which is a thick, white, amylaceous layer, which gives to this variety its remarkable *mealy* appearance when broken. This cortical portion readily cracks transversely, and shells off, leaving the meditullium, which is thinner than in the Jamaica kind. The taste of the root is amylaceous, and ultimately somewhat acrid. Its decoction becomes intensely blue by the addition of a solution of iodine. Its powder is fawn-coloured, and when rubbed with water and tincture of iodine, becomes intensely bluish black. From five pounds of the root of fine quality about one pound of extract may be procured (Hennell). A sample, examined by Mr. Battley, yielded six and a half ounces of extract from three pounds of root, which is about ten and a half ounces from five pounds: 874 grains of the cortical portion of the root yielded 230 grains of extract (Battley.) In one operation, in the laboratory of a friend of mine, 170 lbs. of root yielded 45 lbs. of extract. According to Mr. Pope, the cortex yields twice as much extract as the meditullium.

FIG. 119.



Magnified view of a section of Honduras Sarsaparilla.

This and the preceding wood-cut are from drawings made by my assistant, Mr. Letheby.

The letters refer to the same parts as those of fig. 118.

The hexagonal cellular tissue (*c*) abounds in starch.

5. *Vera Cruz Sarsaparilla; Mexican Sarsaparilla* (*Radix Sarzæ de Vera-Cruz*). This is occasionally imported from Vera Cruz, but is seldom met with in the drug-market. The roots are unfolded (*sarsaparilla longa*) and have the *chump* attached. They are thin, tough, of a light grayish-brown colour, and devoid of starch in the cortex. Mr. Pope terms this variety, "lean, dark, and fibrous." The roots or runners give off very few rootlets. It yields a deep-coloured decoction, which is unchanged by a solution of iodine.

Vera Cruz sarsaparilla is the produce of *Smilax medica*.

I have received from Professor Guibourt the following kinds of sarsaparilla:—

1. *Caraccas Sarsaparilla*, Guib. (*Hist. des Drog.* t. ii. p. 577). Of this there are two kinds, both of which have portions of the rhizome and aerial stem attached to them. One kind (*la première sorte*, Guib. *op. cit.*) occasionally presents spines on the aerial stem. The other (*la seconde sorte*, Guib. *op. cit.*) comes from Macaraïbo (Maracaïbo?). Professor Guibourt tells me he found, about three years ago, a bale of this second kind, one half of which was made up of the root above referred to, which he calls

Salsepareille-Squine de Macaraïbo, and which he thinks ought rather to be regarded as a *China root* (*Squine*, Fr.) than a sarsaparilla.

Caraccas sarsaparilla has considerable resemblance to the Lima sarsaparilla of English commerce.

2. *Peruvian Sarsaparilla*, Guib. (MS.) "The tuberosities possess a yellow colouring principle, and the stems are rather spongy than ligneous." This kind also appears to me to be closely allied to, if not identical with, Lima sarsaparilla.

3. *Brazilian, called Portugal, Sarsaparilla*, Guib. (*Hist. des Drog.* t. i. p. 578). Accompanying this is a portion of the stem of some monocotyledonous plant (*Timbotitica*) used in tying the roots in bundles. The sample sent me by Professor Guibourt has some resemblance to what I have above called Vera Cruz sarsaparilla; but the quantity is too small to draw any accurate conclusion from it.

4. *Brazilian Sarsaparilla en Souches*, Guib. (MS.) This, I think, is identical with our Vera Cruz sarsaparilla. "I thought at first," says Professor Guibourt, "that it came from the Brazils, because it appeared to me identical with that which constitutes the sarsaparilla called Portugal. But a druggist tells me he has received it wholly under the name of *Tampico Sarsaparilla*."

5. *Mexican*, called *Honduras*, *Sarsaparilla*, Guib. (*op. cit.* t. ii. p. 574). This is not the Honduras sarsaparilla of English druggists. Its colour is paler and yellowish. The roots are more shrivelled, the cortical part is tougher; and, when broken, does not give out a white dust, in consequence of being deficient in the white amylaceous layer which is so abundant in the Honduras variety of our commerce.

The sarsaparilla which Guibourt (MS.) regards as the washed Honduras kind (*Salsepareille Honduras lavée?* Guib.), appears to me to be a distinct species.

6. *Jamaica Sarsaparilla*, Guib. (*op. cit.* p. 515). This is not Jamaica sarsaparilla of English druggists. It appears to me to be very similar to the *Salsepareille Honduras lavée*, Guib. Both kinds have a roseate amylaceous cortex.

7. *Woody Sarsaparilla*, Guib. (*op. cit.* p. 576).

8. *Unknown Sarsaparilla*, Guib. (MS.) "It approaches Caraccas sarsaparilla."

COMPOSITION.—Sarsaparilla was analyzed by Cannobio (*Brugnatelli, Giornale di Fisica*, &c. Dec. ii. vol. i. p. 421, 1818); by Pfaff (*Syst. de Mat. Med.* Bd. vii. S. 90, 1824); by Batka (*Journ. de Pharm.* t. xx. p. 43, 1834); and by Thubeuf (*Journ. de Pharm.* xx. 682, 1834).

Cannobio's Analysis.	
Bitter acrid resin	2·8
Gummy extractive	5·5
Starch	54·2
Woody fibre	27·8
Loss	9·7
Sarsaparilla [Honduras?]	100·0

Pfaff's Analysis.	
Balsamic resin	2·0
Acrid extractive	2·5
Extractive similar to cinchona	3·7
Common extractive	9·4
Gummy extractive	1·4
Starch	trace
Albumen	2·2
Woody fibre	75·0
Moisture	3·0
Loss	0·8
Sarsaparilla [Vera Cruz]	100.0

Batka's Analysis.
1. A crystalline matter (*parallinic acid*)
2. A colouring crystalline matter
3. An essential oil
4. Gum
5. Bassorin
6. Starch
7. Albumen
8. Extractiform matter
9. Gluten and gliadine
10. Fibrous and cellular tissue
11. Lactic acid
12. Acetic acid
13. Salts—namely, chlorides of calcium, potassium, and magnesium, carbonate of lime, oxide of iron, and alumina
Sarsaparilla.

Thubeuf's Analysis.
1. A crystalline substance (*salseparine*)
2. A colouring matter
3. A resinous matter
4. Ligneous matter
5. Starch
6. Chloride potassium
7. Nitrate potash
8. Fixed aromatic thick oil
9. Waxy substance
Sarsaparilla.

1. *Oil of Sarsaparilla.*—100 lbs. of the root yield about ℥j. of volatile oil (Berzelius, *Traité de Chim.* t. vi. p. 211).

The following experiments were made by a friend, a manufacturing chemist, who gave me the products for examination. 140 lbs. of Jamaica sarsaparilla were distilled, by steam heat, at twice, with 220 gallons of water. 50 gallons of a milky liquor were obtained, which were again submitted to distillation until 20 gallons had passed over. 20 lbs. of common salt were added to the distilled product, and heat being applied, 3 gallons were drawn over. The liquor was milky, held in solution carbonate of ammonia, and contained a few drops of a volatile oil, which was heavier than water, was soluble in rectified spirit, and had the odour and acrid taste of sarsaparilla. 100 lbs. of Jamaica sarsaparilla were distilled with 100 gallons of water. The distilled liquor was acid, and formed a white precipitate with solutions of acetate of lead. It was re-distilled: the liquor that first passed over was not ammoniacal, but towards the end of the process became so.

2. *Smilacin.*—Discovered in 1824, by Palotta (*Journ. de Pharm.* x. 543), who termed it *pariglin.* Folchi, about the same time, also procured it, and gave it the name of *smilacin.* Thubeuf, in 1831, called it *salseparin.* In 1833, Batka announced that the active principle of this root was an acid, which he termed *parallinic acid.* Lastly, in 1834, Poggiale (*Journ. de Chim. Méd.* x. 577) shewed the identity of these different substances.

It is procured by decolorizing a concentrated hot alcoholic tincture of sarsaparilla by animal charcoal. The tincture deposits, on cooling, impure smilacin, which may be purified by repeated solutions and crystallization. Soubeiran (*Nouv. Traité de Pharm.* ii. 166) has proposed a more economical process.

It has been frequently asserted that the active principle of sarsaparilla resides in the cortical portion only of the root; but Poggiale asserts that the meditullium is not inert.

Smilacin is a white, crystallizable, odourless, and, in the anhydrous state, almost tasteless substance; very slightly soluble in cold water, more so in boiling water, and depositing from the latter by cooling. Its solution has the bitter acrid taste of sarsaparilla, and froths on agitation. It is soluble in alcohol, ether, and oils. It does not combine with acids to form salts. Strong sulphuric acid colours it red, then violet, and lastly yellow. It dissolves in cold and pure hydrochloric acid; the solution becomes red and afterwards gelatinous, when heated. It is soluble in strong nitric acid: if the solution be heated, nitrous gas escapes; and by evaporation a solid residuum is obtained, which is soluble in boiling water, from which it precipitates in white flocks, as the liquid cools.

Smilacin is closely allied to, if it be not identical with, saponin. Now as the latter is readily converted into an acid (*esculic acid*), so probably is the former: hence, perhaps, the parallinic acid of Batka may not be absolutely identical with smilacin, but bear the same relation to it that esculic acid does to saponin.

Smilacin has the following composition:—

	Poggiale. (Mean of 12 analyses.)	Henry.		Petersen.
Carbon	62·53	62·84		62·80
Hydrogen	8·67	9·76		9·14
Oxygen	28·80	27·40		28·06
Anhydrous Smilacin	100·00	100·00	[Parillina]	100·00

Poggiale gives the following formula for its atomic constitution, $C^8 H^{7\frac{1}{2}} O^3$; while O. Henry (*Journ. de Pharm.* xx. 682) assumes $C^9 H^9 O^3$, and Petersen (Thomson's *Org. Chem.* 279) $C^9 H^8 O^3$. As no definite compound of smilacin has been obtained, these formulæ are of little value. Thubeuf says that hydrated [crystallized] smilacin contains 8·56 water.

Cullerier (*Journ. de Chim. Méd.* t. i. p. 45, Seconde Sér.) gave it to nine syphilitic patients. In doses of six grains the stomach readily supported it; but nine grains caused weight at the stomach and nausea. It appeared to relieve the patients' symptoms, and, in one case, seemed to effect a cure. According to Palotta, pariglin, in doses of from two to thirteen grains, acts as a debilitant, reducing the circulation, sometimes producing constriction of the œsophagus, and exciting nausea and diaphoresis. He thinks it might be useful in chronic rheumatism, skin diseases, &c.

3. *Starch.*—The large quantity of starch found in Honduras sarsaparilla must render this variety nutritive. In the Jamaica and Vera Cruz varieties the quantity is very small.

4. *Resin and Extractive.*—These principles require further examination. On them probably depends a part at least of the medicinal properties of sarsaparilla.

CHARACTERISTICS.—A decoction of sarsaparilla froths greatly when shaken. It scarcely, if at all, reddens litmus. Diacetate of lead, and protonitrate of mercury, cause precipitates. Alkalies deepen the colour of the decoction. Solution of iodine forms a copious blue precipitate (*iodide of starch*) in the decoction both of Honduras and Lisbon sarsaparilla. Sesquichloride of iron slightly deepens the decoction (in different degrees in different specimens), and in some causes a flocculent precipitate, which subsides slowly. A strong decoction of Honduras sarsaparilla forms a copious precipitate (*starch*) on the addition of alcohol.

COMMERCE.—The following are the quantities of sarsaparilla on which duty (sixpence per lb.) was paid for the last four years (*Trade List* for 1835-6-7-8):—

For 1835	122,413 lbs.	For 1837	101,298 lbs.
1836	125,140	1838	121,888

The countries from which sarsaparilla was imported in 1831 are thus stated in a parliamentary return (*Statement of the Imports and Exports*, for 1831):—

Portugal	16,110 lbs.
Italy and the Italian Islands	107
British Northern Colonies	71
British West Indies	45,063
United States of America	29,122
Mexico	43,254
Guatemala	14
Brazil	31,972
Peru	11,141
Total import	176,854
Retained for home consumption	107,410

PHYSIOLOGICAL EFFECTS. (*a.*) *On vegetables.*—Not ascertained.

(*b.*) *On animals.*—Not ascertained.

(*c.*) *On man.*—Imperfectly determined; no experiments having been made to ascertain its physiological effects.

To the taste, sarsaparilla is slightly acrid, and somewhat nauseous. Diaphoresis is by far the most common effect of its internal use. When the skin is kept cool, diuresis is not unusual. But in estimating the diaphoretic or diuretic power of sarsaparilla, we must take into consideration the amount of liquid in which the medicine is usually taken, and the other medicines which are frequently conjoined with it: for in many instances the diaphoresis or diuresis is referable rather to these than to sarsaparilla.

In several cases I have given the powder of this root in very large doses, in order to ascertain its effects. Nausea, vomiting, and temporary loss of appetite, were alone observed.

Dr. Hancock (*Trans. Med.-Bot. Soc.* 1829) says, that on one patient, an African, an infusion of four ounces of Rio Negro sarsa acted as a narcotic, producing nausea, great prostration of strength, torpor, and unwillingness to move. The pulse was scarcely altered, unless it were a little retarded. Though the effects here stated agree, to a certain extent, with those ascribed to smilacin, they cannot be regarded as the ordinary effects of this root.

In some conditions of system, especially those of a cachectic kind, sarsaparilla acts as a powerful and valuable alterative tonic. Its continued use is often attended with improvement of appetite and digestion, augmentation of strength, increase of flesh, the production of a more healthy tone of mind, and the palliation, or, in some cases, complete disappearance, of various morbid symptoms, as eruptions, ulcerations, pains of a rheumatic character, &c. Sarsaparilla differs in several respects from the bitter vegetable tonics. Though it is not devoid of, yet it does not, as they do, abound, in a bitter principle. It is not adapted for the cure of intermittents, or of simple debility. But its best effects are seen in those depraved conditions of system which the public, and even some medical men, ascribe to the presence of a morbific poison, or to a deranged condition of the fluids. Hence it is frequently denominated *a purifier of the blood.* Those who do not adopt the pathological notion here referred to, call it an *alterative*.

Those varieties of sarsaparilla which abound in starch (as the *Honduras* kind) possess demulcent and nutritive properties.

Uses.—By many practitioners sarsaparilla is considered to possess no remedial properties; by others it is regarded as a medicine of great efficacy. Considering that more than 100,000 lbs. of it are annually consumed in this country, the number of those who entertain the latter opinion cannot be small. It has been justly remarked by Mr. Lawrence (*Lect. on Surg. Lond. Med. Gaz.* vol. v. p. 770), that physicians have no confidence in it, and surgeons a great deal. I think that this fact is readily explained by the circumstance, that physicians are much less frequently called in to prescribe for those forms of disease, in the treatment of which, surgeons have found sarsaparilla so efficacious.

Many practitioners have doubted or denied its remedial activity on what, it must be admitted, are very plausible grounds; viz. that the root possesses very little taste and no smell; that by the ordinary mode of using it, it produces very slight, if any, obvious effects on the animal economy; and that it has failed in their hands to relieve or cure diseases in which others have asserted they found it effectual. They are, therefore, disposed to refer any improvement of a patient's health, under the long-continued use of sarsaparilla, either to natural changes in the constitution, or to the influence of the remedial means with which the sarsaparilla was conjoined. But I would observe, that hitherto no experiments have been made to ascertain what effects the long-continued employment of sarsaparilla may give rise to in the system of a healthy man, and we are not warranted in assuming that none would result because none are observable from the employment of a few doses. Moreover, it is to be remembered that some of our most powerful poisons prove the most efficacious remedies, when given in such small doses that they excite no other obvious effect on the system than the removal of morbid symptoms. Witness the beneficial influence of minute doses of arsenious acid in lepra. Furthermore, no one has ascribed to sarsaparilla the power of a specific, and its warmest advocates admit its occasional failure. But so often has it been found, that various diseases, which had resisted all other tried remedial means, and were gradually increasing, became stationary, and afterwards subsided, under the use of sarsaparilla, that a large majority of British surgeons, including the most eminent of the present day, have been compelled to admit its therapeutic power.

As no obvious relationship exists between its known physiological effects and its apparent therapeutic agency, an argument has been raised against its medicinal activity, on the ground that we cannot explain its *methodus medendi*; but, for the same reason, we might refuse to admit the power of cinchona to cure ague. Mr. Lawrence (*op. cit.*

p. 769) justly observes, that, although we cannot point out the manner in which a remedy "operates, we are not, on that account, to withhold our confidence in its power. It is enough for us, in medical science, to know that certain effects take place. In point of fact, we are in many cases unable to distinguish the *modus operandi* of medicines—the manner in which their influence is produced." The most plausible explanation of the agency of alterative medicines is that offered by Müller (*Physiology*, vol. i. pp. 59 & 363), and which I have before had occasion to notice (p. 10). It assumes that these remedies cause changes in the nutritive fluids (the chyle and blood), and thereby produce slight chemical alterations in organs morbidly changed in composition, by which already existing affinities are annulled, new ones induced, and the vital principle enabled to effect the further restoration and cure. This hypothesis may be used to explain the remedial influence of sarsaparilla.

Sarsaparilla has been found especially serviceable in the following maladies:—

1. *In inveterate venereal disease.*—It is beneficial principally when the malady is of long continuance, and the constitution is enfeebled and emaciated, either by the repeated attacks of the disease, or by the use of mercury. In such cases it is, as Sir William Fordyce (*Med. Obs. and Inq.* vol. i. p. 169) correctly observed, "the great restorer of appetite, flesh, colour, strength, and vigour." When the disease resists, or is aggravated by the use of mercury, sarsaparilla evinces its most salutary powers. It is given to relieve venereal pains of a rheumatic character; to remove venereal eruptions; to promote the healing of ulcers of the throat; and to assist in the cure when the bones are affected. In recent chancre, or bubo, it is of little use; nor does it appear to possess the least power of preventing secondary symptoms. We cannot ascribe to it "the same anti-syphilitic properties—that is, the same power of arresting or curing the venereal disease—that experience warrants us in attributing to mercury" (Lawrence, *op. cit.* p. 769; see also Mr. Pearson's *Observations on the Effects of various Articles of the Materia Medica in the Cure of Lues Venerea*, p. 39, 1800). Sarsaparilla is sometimes given alone, but more frequently with other remedies: as with stimulating diaphoretics (mezereon, sassafras, and guaiacum), or with mercurials in small or alterative doses, or with acids (especially the nitric), or with alkaline substances (as potash or lime), or with the bitter tonics. It is difficult to lay down concise rules to guide us in the selection of these adjuncts. In venereal pains and eruptions, sudorifics, the copious use of warm diluents and warm clothing, are especially applicable, and should be conjoined with sarsaparilla. In scrofulous constitutions, with enlarged glands, it will be for the most part advisable to avoid the use of mercury. In such I have seen the alkalies most serviceable. When extreme debility is present, the bitter tonics and nitric acid are often added to sarsaparilla with benefit.

2. *In chronic rheumatism* sarsaparilla is often advantageously conjoined with powerful sudorifics and anodynes (as opium or hyoscyamus), especially when any suspicion exists as to the venereal origin of the disease.

3. *In obstinate skin diseases* benefit is frequently obtained by the use of sarsaparilla. Its employment is not confined to cutaneous affections

of one particular elementary form, since it is given with good effect in papular, vesicular, pustular, and tubercular skin diseases, of a chronic kind, when they occur in enfeebled and emaciated constitutions. Though, in these cases, its value principally depends on its tonic and alterative effects, its diaphoretic operation is to be encouraged by the use of diluents, warm clothing, &c.

4. *In cachectic conditions of the system generally*, sarsaparilla may be given, often with the best effects, and never with any ill consequences, save that of occasionally producing slight nausea. Indeed, one of the great advantages of sarsaparilla over many other alteratives and tonics, is, that although it may fail in doing good, it never does any harm beyond that of now and then causing slight disorder of stomach. In chronic abscesses, attended with profuse discharge, diseases of the bones, obstinate ulcers, chronic pulmonary affections accompanied with great wasting of the body, enlarged glands, and various other maladies connected with a depraved state of the system, sarsaparilla is often a very useful medicine.

Administration.—Sarsaparilla is exhibited in substance, and in the form of infusion, decoction, extract, and syrup.

1. *Pulvis Sarzæ.*—The ordinary dose of this is from half a drachm to one or two drachms. Half an ounce frequently nauseates, and in some cases gives rise to vomiting. Powder of Jamaica sarsaparilla is to be preferred to that of other varieties. It is redder than that of the Honduras kind, and produces a much less intense blue colour when rubbed with water and tincture of iodine. I have been informed that some druggists employ, in the preparation of the powder, the roots from which the extract has been prepared. This fraud may be detected by the powder being almost devoid of taste, macerating it in water, and carefully comparing the infusion with one prepared from an unadulterated sample.

2. *Infusum Sarsaparillæ compositum*, D.—Sarsaparilla root previously cleansed with cold water and sliced, ℥j.; Lime Water, Oj. Macerate for twelve hours in a covered vessel, with occasional agitation, and strain. According to Mr. Battley (*Lond. Med. Rep.* xix. 169) lime water is not so good a solvent for the constituents of sarsaparilla root as distilled water: for 874 grains of the root lost only 140 grains by maceration in lime water; whereas the same quantity of root lost 175 grains in distilled water. The dose of this infusion is from f℥iv. to f℥vj. two or three times a day.

3. *Decoctum Sarzæ*, L. E. *Decoctum Sarsaparillæ*, D.—Sarza, sliced [and cleansed with cold water, *D.*], ℥v. [℥iv. *D.*]; Boiling Water, Oiv. "Macerate for four hours, in a vessel lightly covered, near the fire, then take out and bruise the sarsaparilla. When bruised return it to the liquor, and again macerate in the same manner for two hours; afterwards boil down to two pints, and strain." An objection has been taken to this, as well as to all preparations of sarsaparilla made by boiling, that the heat employed volatilizes or decomposes the active principle of the root. "An infusion of sarsaparilla," says Soubeiran (*Nouv. Traité de Pharm.* t. ii. p. 168), "which is odorous and sapid, loses both its odour and taste by boiling for a few minutes: these changes speak but little in favour of the decoction. On the other hand, it is known that the fibrous parts of vegetables always give

less soluble matters to water, when treated by decoction; and if it be added, that sarsaparilla is completely exhausted by hot water, I cannot see what advantages the decoction can possess over preparations made by other methods." Without denying the injurious effects of long boiling, and, therefore, the superiority of preparations made without it, I cannot admit that either the decoction or extract of sarsaparilla is inert. No objection, however, exists to the substitution of an *infusion* for a decoction. But it is advisable to employ a somewhat larger quantity of the root, and to have it crushed before macerating it. The proportions of root and water, in the above preparation, are such that one ounce of the decoction contains the extractive of one drachm only of the root. Hence the extract or syrup is usually conjoined. An infusion or decoction of Jamaica sarsaparilla produces little or no blue colour with tincture of iodine: whereas the corresponding preparations of Honduras sarsaparilla (the kind usually met with, cut in small split lengths, in the shops) becomes bluish black on the addition of a solution of iodine. The dose of *Decoctum Sarzæ*, Ph. L. is f℥iv. to f℥viij. three or four times daily.

4. *Decoctum Sarzæ compositum*, L. E. *Decoctum Sarsaparillæ compositum*, D.—Decoction of Sarsaparilla, boiling hot, Oiv.; Sassafras, sliced and bruised; Guaiacum-wood shavings; Liquorice-root, bruised, of each ℥x. (℥j. *D.*); Mezereon [bark of the root], ℥iij. [℥ss., *E.*] Boil for a quarter of an hour, and strain. This preparation is an imitation of the celebrated *Lisbon diet drink.* The objections made to the use of ebullition in preparing the simple decoction, apply equally to the present preparation. The additions are for the most part valueless. The guaiacum wood is useless, water not being able to dissolve the resin. The volatile oil contained in the sassafras wood is in part dissipated by the boiling. The mezereum, an active agent, is used in such small quantity, that it can confer but little medicinal power. The liquorice is employed merely to communicate flavour. An improvement in the present formula would be to omit the guaiacum, to increase the quantity of sarsaparilla and mezereum, and to substitute maceration for decoction. The dose of the officinal preparation is from f℥iv. to f℥vj. three or four times a day. The syrup or extract is usually conjoined with it. During its use the skin should be kept warm.

5. *Syrupus Sarzæ*, L. E. *Syrupus Sarsaparillæ*, D.—Sarza, sliced, ℥xv. [Oj., *D.*]; Boiling Water, *Cong.* j.; Sugar, ℥xv. Macerate the sarsaparilla in the water for twenty-four hours; then boil down to four pints, and strain the liquor while hot; afterwards add the sugar, and evaporate to a proper consistence. Simonin (*Journ. de Pharm.* xx. 110) has successfully prepared the syrup by the percolation method.

This, I conceive, to be a very unnecessary preparation; for as Dr. A. T. Thomson (*Lond. Dispens.* 9th ed.) justly observes, "it can be much better and more easily supplied by rubbing up a few grains of the extract with some simple syrup." It is, however, frequently prescribed as an adjunct to the decoction. Prepared with Jamaica sarsaparilla it is not liable to ferment, and its flavour is somewhat agreeable, being very analogous to that of West Indian molasses. Mr. Brande (*Dict. of Mat. Med.*) says, that the above syrup is not of sufficient strength to render it an effective form of sarsaparilla; and that it ought to be of such strength that one ounce is equal to a pint of the simple decoction: of this, ℥ss. or ʒvi. may be taken two or three times a day, diluted with about two parts of water. A few drops of solution of potassa sometimes prevents its disagreement with the stomach.

The *syrup of sarsaparilla* of the United States Pharmacopœia is intended to represent the famous French *sirop de cuisinier.* It is prepared with proof spirit, which extracts the acrid principle of the root without taking up the inert fecula; and the tincture being evaporated, to get rid of the alcohol, is made into syrup. By this means the long-continued boiling is avoided. As the editors of the *United States Dispensatory* speak most confidently of the remedial value of this preparation, I subjoin the formula for its preparation, taken from the American Pharmacopœia :—

Syrup of Sarsaparilla. U. S.—Sarsaparilla, bruised, Oij.; Guaiacum wood, rasped, ℥iij.; Red Roses; Senna; Liquorice root, bruised, each, ℥ij.; Oil of Sassafras; Oil of Anise, each, ♏v.; Oil of Partridge-berry [*Gualtheria procumbens*, an astringent aromatic] ♏iij.; Sugar, Oviij.; Diluted Alcohol, Ox. [*wine measure*]. "Macerate the Sarsaparilla, Guaiacum wood, Roses, Senna, and Liquorice root, in the diluted Alcohol for fourteen days; then express and filter through paper. Evaporate the tincture, by means of a water-bath, to four pints and a half; then add the Sugar, and dissolve it, so as to form a syrup. With this, when cold, mix the Oils previously triturated with a small quantity of the syrup." The dose is f℥ss. (equivalent to somewhat less than ℥j. of the root), taken three or four times a day.

6. Extractum Sarzæ, L. *Extractum Sarsaparillæ*, D.—Sarsaparilla, sliced, lb. iiss. [lb. j. *D.*]; Boiling [distilled, *L.*] Water, *Cong.* ij. [*Cong.* j. D.] Macerate for twenty-four hours, then boil down to a gallon [four pints, *D.*], and strain the liquor while hot; lastly, evaporate to a proper consistence.

7. Extractum Sarzæ fluidum, E. *Extractum Sarsaparillæ fluidum*, D. *Fluid Extract of Sarsaparilla*, offic.—Sarsaparilla, sliced [in chips, *E.*], lb. j.; [Boiling, *E.*] Water, Ovj. [Oxij., *D.*] "Let them boil together for an hour, and pour off the liquor; then add twelve pints of water, and repeat the boiling and pouring off. Press strongly the liquor from the remaining material, set aside the mixed liquors that the fæces may subside; then evaporate the mixture by continual boiling down to thirty ounces, and add two ounces of rectified spirit." *Dub.*

"Digest the root for two hours in four pints of the water; take it out, bruise it, replace it in the water, and boil for two hours; filter and squeeze out the liquid; boil the residuum in the remaining two pints of water, and filter and squeeze out this liquor also; evaporate the united liquors to the consistence of thin syrup; add, when the product is cool, as much rectified spirit as will make in all sixteen fluid ounces. Filter.—This fluid extract may be aromatized at will with various volatile oils or warm aromatics." *Ed.*

Jamaica sarsaparilla should be used in the preparation of the extract. Honduras and other inferior kinds of sarsaparilla are to be avoided. The chumps so frequently used by pharmaceutical chemists should be rejected. The small root fibres, commonly called the *beard*, of Jamaica sarsaparilla, are to be preferred, as containing less starch and woody fibre, and a large quantity of the cortical layer. I am informed that they yield a much greater quantity of extract than the runners. Steam heat must be employed to effect the evaporation of the decoction, and the temperature employed should little if at all exceed 212° F. When the concentrated decoction (especially of the Honduras kind) is allowed to cool, as at night, a kind of fermentation is readily set, and gas is copiously evolved. The *fluid extract* is to be preferred to the ordinary more consistent preparation. The quantity of extract obtained from different kinds of sarsaparilla has been already noticed. For further information on this point I must refer the reader to the papers of Mr. Battley (*Lond. Med. Rep.* xix. 168); Mr. Pope (*Med.-Chir. Trans.* xii. 344); and M. Thubeuf (*Journ. de Pharm.* t. xvi. and xviii.)

Extract of Jamaica sarsaparilla, when rubbed on white paper or porcelain, exhibits a reddish tint not observable in the extract of the Honduras kind. The flavour and odour are also characters which assist in distinguishing well-prepared extract. Rubbed up with water it is almost completely soluble, and the solution, which should be clear, by standing, deposits scarcely any thing. The dilute solution should not become blue on the addition of a solution of iodine.

Extract of sarsaparilla is declared by many writers to be an inert and useless preparation; but the assertions are, for the most part, founded rather on theoretical than practical considerations. I have extensively used it, and believe that when it is properly prepared from Jamaica sarsaparilla, it is a most valuable and efficient remedy; and the enormous quantity of it which is consumed by the profession generally (including some of the most eminent of its members), is a proof that many others entertain a similar opinion of it. It is given in doses of from half a drachm to two or three drachms three or four times a day. It should be rubbed down with water, and flavoured by the tincture of orange-peel, or by some volatile oil (as the oil of cloves, allspice, lemon, or cinnamon). Alkalies render its flavour somewhat disagreeable, though they frequently increase greatly its remedial powers.

8. *Extractum Sarzæ compositum.*—Not in any Pharmacopœia, but kept in the shops. It is made by mixing with extract of sarsaparilla an extract prepared by evaporating a decoction of mezereon bark, liquorice root, and guaiacum shavings, and a small quantity of oil of sassafras. This preparation is employed as a convenient substitute for the compound decoction of sarsaparilla. The dose of it, and the mode of exhibition, is the same as of the simple extract. Three quarters of an ounce of the compound extract are equal to a pint of the compound decoction.

Other Medicinal Smilaceæ.

The *China root* of the shops (*Radix Chinæ orientalis*) is the produce of *Smilax China* (Linn.), and is said to come from the province of Onansi, in China. It occurs in large, ligneous, knotty pieces, of from three to eight inches long, and an inch or two thick. Externally it has a grayish-brown colour, and internally a light flesh or yellowish-white colour. It is inodorous, and has a slightly astringent taste. It appears to consist of *extractive, tannic acid, colouring matter, starch,* and *woody fibre.* It was introduced into Europe in 1535 as an infallible remedy for the venereal disease, and obtained great celebrity in consequence of the benefit which the Emperor Charles the Fifth is said to have derived from it in gout. Its effects are not very obvious, but it is said to be diaphoretic. It tinges the sweat. It has been used in the same maladies as sarsaparilla; viz. venereal diseases, rheumatism, and gout, obstinate skin diseases, &c. It is given in the form of decoction.

The *American China root* (*Radix Chinæ Americanæ*) is brought from Mexico, and is said to be the produce of *Smilax Pseudo-China.*

Smilax aspera is used in the south of Europe as a substitute for sarsaparilla; but the substance sold in London under that name is brought from India, and is the produce of *Hemidesmus indicus,* and will be described hereafter.

ORDER 14. IRIDA'CEÆ, *Lindl.*—THE CORNFLAG TRIBE.

IRIDEÆ, *Juss.*

ESSENTIAL CHARACTERS.—*Calyx* and *corolla* superior, confounded, their divisions either partially cohering, or entirely separate, sometimes irregular, the three petals being sometimes very short. *Stamens* three, arising from the base of the sepals; *filaments* distinct or connate; *anthers* bursting externally lengthwise, fixed by their base, two-celled. *Ovary* three-celled, cells many-seeded; *style* one; *stigmas* three, often petaloid, sometimes two-lipped. *Capsule* three-celled, three-valved, with a loculicidal dehiscence. *Seeds* attached to the inner angle of the cell, sometimes to a central column, becoming loose; *albumen* corneous, or densely fleshy; *embryo* enclosed within it.—*Herbaceous* plants, or very seldom *under-shrubs*, usually smooth; the hairs, if any, simple. *Roots* tuberous or fibrous. *Leaves* equitant, distichous in most genera. *Inflorescence* terminal, in spikes, corymbs, or panicles, or crowded. *Bracts* spathaceous, the partial ones often scarious; the *sepals* occasionally rather herbaceous (*Lindley*).

PROPERTIES.—The underground stems and roots usually abound in fecula and mucilage; but these nutritive substances are generally combined with an acrid principle, which excludes their employment as articles of food. However, *Moræa edulis*, *M. sisyrinchium*, *Gladiolus edulis*, and a species of *Tigridia*, have been used as esculent substances. The rhizomes of several species of *Iris* (as *I. Pseud-acorus*, *I. germanica*, *I. sibirica*, and *I. versicolor*) are remarkable, especially in the fresh state, for their acridity, in consequence of which some of them have been used as purgatives, sialogogues, or errhines, or for issue-peas. The rhizomes of some species (as *I. florentina* and *I. germanica*) have an agreeable smell. The colour and the odour of saffron are to be regarded as part of the petaloid qualities of the stigmata of *Crocus*. The effects of this medicine on the nervous system are regarded by Decandolle (*Essai sur les Propriétés Méd.*) as similar to those of [certain odorous] flowers.

Cro'cus sati'vus, Allioni, L. E. D.—*The Saffron Crocus.*

Sex. Syst. Triandria, Monogynia.

(Stigmata exsiccata, *L.* Stigmata, *E. D.*)

HISTORY.—Saffron is mentioned in the Old Testament (*Solomon's Song*, iv. 14). Homer (*Iliad*, xiv. 346) speaks of the *Crocus* (κρόκος). Hippocrates (*Opera*, Ed. Fœs. pp. 407, 575, 614, 626, and 876) employed saffron in uterine and other maladies. The word *Saffron* (*zafaran*, Avicenna) is of Arabic origin.

BOTANY. *GEN. CHAR.*—*Perianth* [coloured], with a slender tube twice as long as the limb; limb six-partite, equal, erect. [*Stamens* three, inserted into the tube; *anthers* sagittate.] *Stigmas* three, thick, convoluted, generally crested. *Capsule* under ground, elevated by a short peduncle from the root, which peduncle elongates after the decay of the flowers, and the capsules appear above ground. (*Hooker*, with some additions.)

SP. CHAR.—*Stigma* protruded, drooping, in three deep linear divisions. (*Hooker.*)

Cormus roundish; its brownish coats reticulated, separating superiorly into distinct parallel fibres. *Leaves* linear, with a white central stripe, and surrounded at their base with long membranous sheaths. *Flowers* light purple, shorter than the leaves, with a two-valved membranous spathe. *Anthers* pale yellow. *Stigmas* deep orange-coloured.

HAB.—A native of Asia Minor. Now naturalized in England, France, Spain, and some other European countries. It is a doubtful native of the Eastern parts of Europe. It is said to have been introduced into Spain by the Arabs (Dillon, *Travels through Spain*). It flowers in September and October.

Preparation.—The flowers are gathered in the morning, and the stigmata, with part of the style, plucked out for use, the rest of the flower being thrown away. The stigmata are then dried on paper, either by means of portable kilns over which a hair-cloth is stretched (Douglas, *Phil. Trans.* for 1728), or in a room by the sun (Fiske, *Stephenson's Med. Bot.* vol. iii.) When dried between paper under the pressure of a thick board and weights, the saffron is formed into cakes now no longer to be met with.

Description.—Two kinds of saffron are kept in the shops, viz. *hay saffron* and *cake saffron.*

1. *Hay Saffron.* (*Crocus in fœno.*)—Consists of the stigmas with part of the style, which have been very carefully dried. They are from an inch to an inch and a half long, thin, brownish red; the upper portion (stigma) is expanded, notched at the extremity; the lower portion, which constitutes part of the style, is called by Th. Martius (*Pharmakogn.*) *Föminelle:* it is narrow, capillary, yellowish. The odour is penetrating, aromatic, and, of large quantities, narcotic. The taste is bitter, somewhat aromatic. When chewed, saffron tinges the mouth and the saliva yellow. I find by careful examination that one grain of good commercial saffron contains the stigmata and styles of nine flowers: hence 4,320 flowers are required to yield one ounce of saffron.

α. *English Saffron* (*Crocus anglicus*) is no longer found in commerce.

β. *Spanish Saffron* (*Crocus hispanicus*) constitutes the best saffron of the shops. It is imported from Gibraltar (principally), Cadiz, Denia, Santander, and Malaga. From the concurrent accounts of pharmacologists it would appear that formerly Spanish saffron was spoiled by being dipped in oil to preserve it. But the saffron now imported from Spain has not been subjected to this treatment. Occasionally, Spanish, as well as any other kind of saffron, is oiled by the dealers to give it an appearance of freshness, but this fraud is, I suspect, usually performed in this country.

γ. *French Saffron* (*Crocus gallicus*) is usually considered in commerce to be of second quality. It is the produce of Gatinais (*Gatinais saffron*) and Orléanais, which comprehend part of the departments of Seine-et-Marne and Eure-et-Loire, and the whole of the department of Loiret. The saffron of Angoulême is the worst (Guibourt, *des Drog.* ii. 254). French saffron is shipped for England at Calais, Boulogne, and Havre.

Besides the preceding, several other varieties of saffron are mentioned by pharmacologists, but they are not distinguished in English commerce, and I am unacquainted with them. Such are *Austrian*, *Bavarian*, *Oriental*, and the *Sicilian saffron* (*C. austriacus*, *bavaricus*, *orientalis*, and *siciliensis*) mentioned by Murray (*App. Med.* vol. v.), Geiger (*Handb. d. Pharm.*), and others. From the Customs report (*Trade List* for 1837-8-9) it appears that saffron is occasionally imported from Hamburgh, Antwerp, Genoa, Naples, and Bombay. But I am ignorant of its place of growth and quality. According to Gussone (Lindley, *Fl. Med.*) *Crocus odorus* yields Sicilian saffron. Dioscorides (*lib.* i. *cap.* xxv.) considered the saffron of Corycus (a mountain of Cilicia, in Asia Minor, now called *Curco*,) to be the best, and that of Lycia and Olympus to be of second quality; while Cyrenaic saffron, as well as that from Centuripinum (now *Centorbe*) in Sicily, he declares to be the worst.

2. *Cake Saffron.* (*Crocus in placentâ*).—Formerly this was compressed hay saffron. But the cakes now met with in the inferior shops are composed of safflower (*Carthamus tinctorius*) and gum-water, made into a paste, and rolled out on a tin plate with a rolling-pin into oval cakes of 11 inches long, 10 inches broad, and about one-tenth of an inch thick.

These are dried on brown paper in a stove. They are shining, and of a brownish red colour. I can detect neither saffron nor marigolds (*Calendula officinalis*) in them. Their price is about one-fifth of that of good hay saffron. I am informed, by a maker of cake saffron, that there is only another person besides himself in London by whom this substance is made.

ADULTERATION.—The only adulteration practised on saffron, which has come under my notice, is that of mixing safflower with saffron, and this I have met with once only. It must have been effected abroad, since the druggist who pointed it out to me bought the saffron in bond, and did not discover the fraud until the saffron had been for some time in his warehouse. The pieces of safflower readily escape the eye of a superficial observer. If rubbed with the moistened finger on paper, they produce a slightly yellow mark only, whereas genuine saffron causes a very intense orange-yellow stain. The fraud may also be detected by infusing the suspected saffron in hot water, when the florets of the safflower may be readily distinguished from the stigmas which constitute saffron.

I am informed that old and dry saffron is sometimes oiled, to give it the appearance of freshness. The stain communicated to the fingers, or white blotting paper, when such saffron is compressed, readily detects the fraud.

Fibres of smoked beef and the petals of the officinal marigold are said to have been used for adulterating saffron. But there is no fear of these adulterations now. Such frauds would be readily detected by the eye, especially when the suspected saffron has been infused in hot water.

COMMERCE.—The quantity of saffron on which duty (of 1s. *per lb.*) is paid, is about 5,000 lbs. *per annum*. The places from which it is imported have been already mentioned. It is brought over in cases, barrels, and boxes.

COMPOSITION.—Saffron was analyzed in 1811 by Vogel and Bouillon-Lagrange (*Bull. de Pharm.* iv. 89), and in 1818 by Aschoff (Gmelin, *Handb. d. Chim.* ii. 1334).

	Vogel and Bouillon-Lagrange.	Aschoff.
Volatile oil	7·5	1·4
Wax	0·5	4·0
Polychroite	65·0	52·0
Gum	6·5	10·4
Soluble albumen	0·5	—
Woody fibre	10·0	19·0
Water	10·0	10·0
Balsamic matter, soluble in ether and alcohol	—	2·0
Saffron	100·0	98·8

1. *Volatile Oil of Saffron. (Oleum Croci).*—Obtained by distilling saffron with water. It is yellow, heavier than water, has a burning, acrid, somewhat bitter taste, and is slightly soluble in water. By keeping, it becomes white, solid, and lighter than water. On it depends probably the medicinal properties of saffron.

2. *Colouring matter; Polychroite* (so called from πολὺς, *many*, and χρόα, *colour*, in consequence of its being susceptible of numerous changes of colour).—By digesting the aqueous extract of saffron in alcohol, and evaporating the tincture to dryness, a substance is obtained which Bouillon-Lagrange and Vogel called *polychroite*, but which Henry (*Journ. de Pharm.* vii. 397) has separated into volatile oil and a bitter red sub-

stance (*polychroite properly so called*). Pure polychroite is pulverulent, bitter, scarlet-red, odourless, slightly soluble in cold water, much more so in hot water, readily soluble in alcohol and oils (both fixed and volatile), slightly soluble in ether Sulphuric acid turns it blue, then lilac. Nitric acid makes it green, but the colour is very fugitive. The hypochlorites destroy the yellow colour of a solution of polychroite.

Chemical Characteristics.—An aqueous infusion of saffron gives no indication of starch on the addition of a solution of iodine. The hypochlorites bleach it. Sulphuric and nitric acids act on it as on polychroite above mentioned. Acetate of lead causes no precipitate. By evaporation, the infusion yields an extract from which alcohol removes the colouring matter and leaves a gummy substance.

Physiological Effects.—Formerly saffron was considered to be cordial, aromatic, narcotic and emmenagogue. Some (Boerhaave, *Hist. Plant.* pars ii. p. 590) have accused it of causing laughing delirium; others (Bergius, *Mat. Med.* t. i. p. 38) have ascribed to its use great mental dejection; and several (Boerhaave, *op. cit.;* Riverius, *Op. Med.*) have declared that they have seen immoderate uterine hemorrhage produced by it, which, in the case referred to by Riverius, is said to have terminated fatally. But modern experience has proved that most of these statements are erroneous. Alexander (*Experim. Essays*, p. 88, 1768) swallowed four scruples of saffron without perceiving any obvious effects therefrom; and Wibmer (*Wirk. d. Arzneim.* Band 2, S. 204) took a drachm without observing the slightest effect.

By the long-continued use of saffron, the colouring particles become absorbed, and tinge the secretions, especially the urine and perspiration. In some instances the *fœtus in utero* has been stained by it (Wibmer, *op. cit.*) The failure of Alexander to detect the yellow tinge in his secretions arose probably from the short time he had been using this medicine. Mr. Gibson (*Mem. of the Lit. and Phil. Soc. of Manchester*, 2nd Ser. vol. i. p. 148) gave a considerable quantity of saffron to a pigeon, which thereby had its fæces tinged, yet no perceptible alteration was produced in its bones.

Headache, prostration of strength, apoplexy, and even death, have been ascribed to the inhalation of the vapour arising from large quantities of saffron (see the reports of Borellus, Tralles, Forster, and others, quoted by Wibmer and Murray, *op. cit.*); and perhaps correctly so, for it is well known that the odours of other plants (as the rose, the pink, &c.) act on some individuals as narcotic poisons (Orfila, *Toxicol. Gén.*)

Uses.—Saffron is employed, especially on the continent, as a flavouring and colouring ingredient in various culinary preparations, articles of confectionary, liqueurs, &c. It was used by the ancients as a perfume as well as a seasoning agent (Beckmann, *Hist. of Invent. and Discov.* vol. i. p. 278).

In the modern practice of medicine it is used chiefly as a colouring ingredient. It is a popular remedy for assisting the eruption of exanthematous diseases; on the same principle, I suppose, that bird-fanciers give it to birds when moulting. It was at one time esteemed as an antispasmodic in asthma, hysteria, and cramp of the stomach; and was formerly used as an emmenagogue, and to promote uterine contractions and the lochial discharge. Lastly, it has been employed as a stimulant to the nervous system in hypochondriasis.

Administration.—It may be given in doses of from ten to thirty grains, in the form of powder or pill. It is popularly used in the form of infusion, or *tea.*

Syrupus Croci, L. E.—Saffron, ℥x.; Boiling Water, Oj.; Sugar, lb. iij. "Macerate the saffron in the water for twelve hours, in a vessel lightly covered, then strain the liquor, and add the sugar to it," *L.* It is employed principally for its colour.

As a colouring and flavouring ingredient, saffron is a constituent of several other preparations.

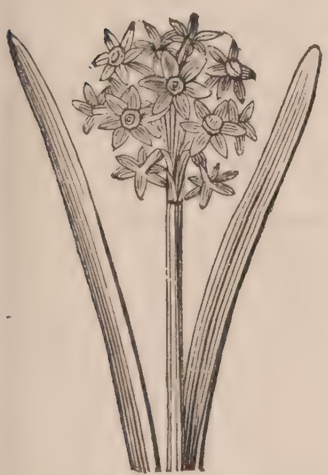
Other Medicinal Iridaceæ.

The *Orris Root* of the shops is the rhizome of *Iris florentina*, and perhaps also of *I. pallida.* It is imported in casks from Leghorn and Trieste. It consists, according to Vogel (*Journ. de Pharm.* i. 481) of *volatile oil, acrid resin, astringent extractive, gum, starch*, and *ligneous matter.* Raspail (*Chim. Organ.*) detected in it crystals of *oxalate of lime.* Orris root is an acrid substance, and in full doses causes vomiting and purging. It is principally used on account of its violet odour. Thus *hair* and *tooth powders, perfumed oils*, &c. are frequently scented with it. During teething, infants are sometimes permitted to rub their gums with, and bite, the rhizome; but the practice is objectionable, since it is not unfrequently attended with irritation of the mouth and disorder of the stomach and bowels. Furthermore, the danger of the rhizome getting into the œsophagus or trachea is not to be overlooked. One fatal case of this kind is recorded (Kraus, *Heilmittellehre*, S. 541). Powdered orris root is sometimes used as an errhine.

Order 15. Amaryllida'ceæ, *Lindl.*—The Narcis'sus Tribe.

None of the plants of this order are employed in England as articles of the Materia Medica. Yet many of them act powerfully on the system, and one of them (*Hæmanthus toxicarius*) is said to be used by the Hottentots to poison their arrow-heads. The prevailing property of the order is acridity, which is possessed principally by the bulbs, several of which (as those of *Pancratium maritimum* and *Hæmanthus coccineus*) seem to be endowed with properties very similar to those of squill. The leaves and flowers of *Narcissus Pseudo-Narcissus* are enumerated among the simples of the French *Codex.* In doses of 20 or 30 grains they sometimes cause vomiting. They have been employed in spasmodic affections, (as hooping-cough), in diarrhœa, and in agues (Merat and De Lens, *Dict. de Mat. Méd.* t. iv.) Several other species of *Narcissus*, as *N. Tazetta* and *N. odorus*, also possess emetic properties (Decandolle, *Essai sur les Propriétés Méd.*)

Fig. 120.



Narcissus Tazetta.

Supposed by Dr. Sibthorpe to be the Narcissus of the poets.

Order 16. Musa′ceæ, *Agardh.*—The Bana′na Tribe.

None of the Musaceæ are used in medicine. But the importance of the banana (*Mu′sa sapien′tum*) and plantain (*M. paradisi′aca*), as articles of food, is so great to the inhabitants of some tropical countries, that it would be almost inexcusable to pass by the order without a notice. "But for plantains," says Dr. Wright (*London Med. Journ.* vol. viii.), Jamaica "would scarcely be habitable, as no species of provision could supply their place. Even flour, or bread itself, would be less agreeable and less able to support the laborious negro, so as to enable him to do his business, or to keep in health." (See also Humboldt's *Pl. Æquinoc.*) Boussingault (*Journ. de Pharm.* xxii. 385) analysed the fruit of *Musa paradisiaca*, and found in it *sugar*, *gum*, *malic*, *gallic*, and *pectic acids*, *albumen*, and *lignin*.

Fig. 121.

The Banana.

Fig. 122.

The Plantain.

Order 17. Maranta′ceæ, *Lindl.*—The Arrow-Root Tribe.

Essential Characters.—*Calyx* superior, of three sepals, short. *Corolla* tubular, irregular, with the segments in two whorls; the *outer* three-parted, nearly equal, the *inner* very irregular; one of the lateral segments usually coloured, and formed differently from the rest; sometimes by abortion fewer than three. *Stamens* three, petaloid, distinct, of which one of the laterals and the intermediate one are either barren or abortive, and the other lateral one fertile. *Filament* petaloid, either entire or two-lobed, one of the lobes bearing the anther on its edge. *Anther* one-celled, opening longitudinally. *Pollen* round (papillose in Canna coccinea, smooth in Calathea zebrina). *Ovary* three-celled; *ovules* solitary and erect, or numerous and attached to the axis of each cell; *style* petaloid or swollen; stigma either the mere denuded apex of the style, or hollow, hooded, and incurved. *Fruit* capsular, as in Scitamineæ. *Seeds* round, without aril; *albumen* hard, somewhat floury; *embryo* straight, naked, its *radicle* lying against the hilum (*Lindley*).

Properties.—The rhizomes abound in fecula.

Maran′ta arundina′cea, Linn. L. E.—*The Indian Arrow-Root.*

Sex. Syst. Monandria, Monogynia.

(Arrow-root: Rhizomatis fæcula. *Lond.*—Fecula of the tubers: Arrow-root. *Ed.*)

History.—This plant was brought from the island of Dominica, by Colonel James Walker, to Barbadoes, and there planted. From thence it was sent to Jamaica. That gentleman observed that the native Indians used the root against the poison of their arrows, by mashing and applying it to the poisoned wounds (Sloane's *Jamaica*, vol. i. p. 254).

Botany. *Gen. Char.*—*Corolla* unequal, one of the inner segments in the form of a lip. *Stamens* petaloid, with half an anther on its edge. *Style* hooded, adhering to the edge of a sterile filament. *Ovary* three-celled, smooth; *ovules* solitary. *Fruit* even, dry, one-seeded.—Caulescent plants with fleshy *rhizomata* or *tubers*. *Stems* branched, often dichotomous. *Inflorescence* terminal, panicled, jointed, with glumaceous, deciduous *bracts*. (*Lindley*).

Sp. Char.—*Culm* branched, herbaceous. *Leaves* ovate, lanceolate, somewhat hairy underneath. *Peduncles* two-flowered. (*Willdenow*).

Rhizome white, articulated, tuberous, placed horizontally in the earth, and giving origin to several, tuberous, jointed stoles (*stolones tuberosi*), similar to itself, but covered with scales. Those stoles are often more than a foot long and curved, so that the points rise out of the earth and become new plants (*Nees* and *Ebermaier*). *Stem* two to three feet high. *Leaves* alternate, with long, leafy, hairy sheaths. *Flowers* white and small.

The *Maranta indica Tussac* (*Journ. Bot.* iii. 41) *Ph. Ed.* is characterized by its leaves being smooth on both sides, and by its white seeds; those of *M. arundinacea* being violet. But after a careful examination Wickström declares that Tussac's plant is identical with the *M. arundinacea*, Linn. (Nees v. Esenb. and Eberm. *Handb. d. Med. pharm. Bot.*)

Hab.—West Indies. In Jamaica it is cultivated in gardens and provision grounds.

Extraction of the Fecula.—The roots (tubers), when a year old, are dug up, well washed in water, and then beaten in large, deep, wooden mortars to a pulp. This is thrown into a large tub of clean water. The whole is then well stirred, and the fibrous part wrung out by the hands and thrown away. The milky liquor being passed through a hair-sieve, or coarse cloth, is suffered to settle, and the clear water is drained off. At the bottom of the vessel is a white mass, which is again mixed with clean water and drained; lastly, the mass is dried on sheets in the sun, and is pure starch (Wright, *Lond. Med. Journ.* vol. viii.)

Properties.—The fecula (*fæcula marantæ*), called in the shops *West Indian arrow-root*, is white, odourless, and tasteless. It is in the form either of a light opake white powder or of small pulverulent masses. When pressed between the fingers it feels firm, and, when rubbed, produces a slight crackling noise. Examined by the microscope it is found to consist of granules, which are never perfectly spherical, but are frequently elliptical, sometimes obscurely triangular, and occasionally have the shape of a painter's muller.

East India Arrow-root is the fecula procured from *Curcuma angustifolia*, and will be described hereafter. (Vide p. 686).

Brazilian Arrow-root is the fecula of *Jatropha Manihot*. It is described by M. Guibourt (*Hist. des Drog.* ii. 456, 3me ed.) under the name of *Moussache* or *Cipipa*, and will be noticed hereafter. (Vide Euphorbiaceæ.)

Composition.—Arrow-root has been analyzed by Dr. Prout (*Phil. Trans.* 1827), who obtained the following results:—

	Air dried.	*Dried between 200° and 212° for 20 hours.*	*Dried at 212° for six hours longer.*
Carbon	36·4	42·8	44·4
Water	63·6	57·2	55·6
Arrow-root	100·0	100·0	100·0

The formula which agrees with the third analysis is $C^6 H^5 O^5$.

Dr. Prout regards arrow-root as a low variety of starch analogous to the low sugar of honey; while wheat-starch he considers to be the most perfect form of starch, and analogous to sugar-candy.

COMMERCE.—Arrow-root is brought, in tin cases and in barrels and boxes, from the West India Islands (Jamaica, Barbadoes, Antigua, St. Vincent, Dominica, Bermuda, St. Kitt's, Grenada, Demarara, and Berbice). *Bermuda arrow-root* is esteemed the most, whether justly or otherwise I know not. Importations of a fecula called arrow-root are occasionally made from Calcutta, and sometimes from Para, Maranham, and Sierra Leone.

The quantity of arrow-root on which duty (of one shilling *per cwt.*) was paid during the last four years, is as follows:—

	Cwts.		*Cwts.*
In 1835	3,581	In 1837	2,853
1836	3,280	1838	2,538

ADULTERATION.—Potatoe-starch (sold in the shops as *English Arrow-root*) is said to be sometimes substituted for the Indian arrow-root. The fraud may be readily detected by a good microscope. The particles of potatoe-starch are distinguished from those of Indian arrow-root by their larger size, and by the concentric markings (regarded by Raspail, *Chim. Org.* 2me ed. as rugæ; by Fritzsche, *Poggend. Ann. d. Phys.* Bd. xxxii. as indications of concentric layers) on their surface.

PHYSIOLOGICAL EFFECTS.—Nutritive, emollient, and demulcent. It is somewhat less nutritive than wheat-starch, but more palatable and digestible.

USES.—Employed at the table, as an article of food, in the form of puddings. It forms a nutritious, easily-digested, agreeable, non-irritating diet for invalids or infants. In irritation of the alimentary canal, of the pulmonary organs, or of the urinary apparatus, it is especially valuable, as a nutritive, emollient, and demulcent.

ADMINISTRATION.—To invalids and infants it is exhibited when boiled in water or milk and flavoured. Milk disagrees with some patients, and in such is of course to be avoided. The addition of sugar improves the flavour and increases the nutritive qualities. Spices, lemon juice, or wine, may be employed according to circumstances.

Other Dietetical or Medicinal Marantaceæ.

Recently a fecula has appeared in the shops, under the name of *Tous les Mois*, or *Starch of the Canna coccinea*. It comes from St. Kitt's, and is sold by Messrs. Hickson and Co. of 72, Welbeck Street, and is said to be prepared by a tedious and troublesome process, from the root (rhizome) of the plant above named. It has been recommended as forming a valuable article of food for the invalid (Johnson's *Med.-Chir. Rev.* Oct. 1, 1836). On a microscopical examination of it, I find that its particles agree, in form and structure, with those of the ordinary potatoe-starch, from which, however, they are distinguished by their larger size.

ORDER 18. ZINGIBERA'CEÆ, *Lindl.*—THE GINGER TRIBE.

DRYMYRHIZEÆ, *Vent.*—SCITAMINEÆ, *R. Brown.*

ESSENTIAL CHARACTERS.—*Calyx* superior, tubular, three-lobed, short. *Corolla* tubular, irregular, with six segments in two whorls; the *outer* three-parted, nearly equal, or with the odd segment sometimes differently shaped; the *inner* (sterile stamens) three-parted, with the intermediate segment (*labellum*) larger than the rest, and often three-lobed, the lateral segments sometimes nearly abortive. *Stamens* three, distinct, of which the two lateral are abortive, and the intermediate one fertile; this placed opposite the labellum, and arising from the base of the intermediate segment of the outer series of the corolla. *Filament* not petaloid, often extended beyond the anther in the shape of a lobed or entire appendage. *Anther* two-celled, opening longitudinally, its lobes often embracing the upper part of the style. *Pollen* globose, smooth. *Ovary* three-celled, sometimes imperfectly so; *ovules* several, attached to a placenta in the axis; *style* filiform; *stigma* dilated, hollow. *Fruit* usually capsular, three-celled, many seeded [sometimes by abortion one-celled]; occasionally berried (the dissepiments generally central, proceeding from the axis of the valves, at last usually separate from the latter, and of a different texture. *R. Br.*) *Seeds* roundish or angular, with or without an aril (*albumen* floury, its substance radiating, and deficient near the hilum, *R. Br.*); *embryo* enclosed within a peculiar membrane (*vitellus, R. Br.* Prodr. *membrane of the amnios*, ibid. in King's Voyage, 21) with which it does not cohere.—Aromatic, tropical, *herbaceous* plants. *Rhizoma* creeping, often jointed. *Stem* formed of the cohering bases of the leaves, never branching. *Leaves* simple, sheathing their *lamina*, often separated from the sheath by a taper neck, and having a single midrib, from which very numerous, simple, crowded veins diverge at an acute angle. *Inflorescence* either a dense spike, or a raceme, or a sort of panicle, terminal or radical. *Flowers* arising from among spathaceous membranous bracts, in which they usually lie in pairs. (*Lindley.*)

PROPERTIES.—Rhizomes and seeds aromatic. The rhizomes of some species are remarkable for the colouring matter which they contain.

Zin'giber officina'le, Roscoe, L. E.—*The Narrow-leaved Ginger.*

Amomum Zingiber, *Linn. D.*

Sex. Syst. Monandria, Monogynia.

(Rhizoma, *L. E.*—Radix, *D.*)

HISTORY.—Dioscorides (lib. ii. cap. 190), and Pliny (*Hist. Nat.* lib. xii.), were acquainted with ginger, which was called ζιγγίβερις by the former, *zingiberi* and *zimpiberi* by the latter of these authors.

BOTANY. *GEN. CHAR.*—*Corolla* with the outer limb three-parted, inner one-lipped. *Filament* lengthened beyond the anther into a simple incurved beak. *Capsule* three-celled, three-valved. *Seeds* numerous, arillate.—*Rhizocarpial* plants. *Rhizomata* tuberous, articulated, creeping. *Stems* annual, enclosed in the sheaths of distichous leaves. *Leaves* membranous. *Spikes* cone-shaped, radical or rarely terminal, solitary, consisting of one-flowered imbricated bracts. (Blume, *Emumerat. Plant. Javæ.*)

SP. CHAR.—*Leaves* sub-sessile, linear-lanceolate, smooth. *Spikes* elevated, oblong. *Bracts* acute. *Lip* three-lobed. (Roxburgh.)

Rhizome biennial. *Stems* erect and oblique, and invested by the smooth sheaths of the leaves; generally three or four feet high, and annual. *Leaf-sheaths* smooth, crowned with a bifid ligula. *Scapes* solitary, six to twelve inches high. *Spikes* the size of a man's thumb. *Lip* dark purple. *Ovary* oval, with numerous *ovules; style* filiform; *stigma* funnel-shaped, ciliate. *Capsule* roundish, unilocular. *Seeds* numerous; mostly abortive. (Roxburgh, *op. cit.* and P. Browne, *Hist. of Jamaica.*)

Hab.—Cultivated in the tropical regions of Asia and America. Native soil doubtful, probably Asia.

Preparation.—The young shoots put forth every spring by the perennial rhizome, are used in the manufacture of the delicious *preserved ginger* (*conditum zingiberis*). These shoots are carefully picked, washed, scalded, scraped, peeled, and then preserved in jars with syrup. (Dr. P. Browne, *Hist. of Jamaica.*)

The *ginger-root* of the shops is prepared when the stalks are wholly withered, and the rhizomes are about a year old. In Jamaica this happens in January or February. The rhizomes are dug up, picked, cleaned, and scalded. *Black ginger* is dried, after being scalded, without being scraped: *white ginger*, on the contrary, requires to be carefully scraped. Both kinds are dried in the sun in the open air.

The differences between the black and white ginger of the shops are ascribed, by Dr. P. Browne (*op. cit.* p. 120) and others, to different methods merely of curing the rhizomes; but this is scarcely sufficient to account for them, and we cannot help suspecting the existence of some difference in the plants themselves. That this really exists is proved by the statement of Rumphius (*Herb. Amboin.* lib. viii. cap. xix. p. 156), that there are two ginger plants, the *white* and the *red.* Moreover, Dr. Wright (*Lond. Med. Journ.* vol. viii.) says, that two sorts are cultivated in Jamaica; viz. the *white* and the *black*; and he adds, "black ginger has the most numerous and largest roots."

When brought to this country, the common kinds of ginger are bleached by washing them in a solution of chloride of lime, and sometimes by exposing them to the fumes of burning sulphur. This treatment, though it may improve the colour, must injure the acridity and aromatic qualities of the rhizomes.

Description.—The *rhizome*, called in commerce *ginger-root* (*radix zingiberis*), occurs in flattish, branched or lobed, palmate pieces, called *races*, which do not exceed four inches in length. The unscraped pieces are covered with a wrinkled epidermis; but those which have been scraped (as the Jamaica variety) are without it. Ginger breaks moderately short, but the fractured surface presents numerous projecting pointed fibres, imbedded in a mealy or farinaceous tissue. A transverse section of the larger and more perfect pieces shows an outer, horny, resinous-looking zone, surrounding a farinaceous centre, which has a speckled appearance from the cut extremities of fibres and ducts. The taste of ginger is aromatic, hot, and biting; the odour of a fresh broken piece is peculiar and pungent, though aromatic. In commerce several varieties, distinguished by their colour and place of growth, are met with.

α. *White ginger.* (*Radix Zingiberis albi.*)—The finest is that brought from Jamaica. *Jamaica white ginger* occurs in larger, rounder, and thinner races than the other kinds. Its epidermis has been carefully removed by scraping. Externally it is yellowish-white or very pale buff: internally it has a pale buff tint: inferior kinds have an ash tint externally. It forms a beautiful bright straw yellow, somewhat buffy, powder. A great part of the Jamaica ginger of the shops has been washed in whiting and water (or *white-washed*, as it is technically termed), under the pretence of preserving it from insects. (Brande, *Dict. of Mat. Med.*) The dark-coloured kinds are frequently bleached with chloride of lime. *Barbadoes ginger* is in shorter, flatter races of a arker colour, and covered with a corrugated epidermis. *African ginger* s in smallish races, which have been partially scraped, and are pale-oloured. *East India ginger* is unscraped; its races are dark ash-coloured xternally, and are larger than those of the African ginger. *Tellicherry inger* is in large plump races with a remarkable reddish tint externally.

β. *Black ginger.* (*Radix Zingiberis nigri.*)—*Jamaica black ginger* is ot frequently found in the shops. The *Malabar dark ginger* is in un-craped short pieces, which have a horny appearance internally, and are f a dirty brown colour both internally and externally.

Commerce.—Ginger is imported in bags, weighing about a hundred veight each. The quantities on which the duty of eleven shillings per wt. has been paid for the last four years, are as follows:—

	Brit. W. Indies. cwts.	*East Indies.* cwts.	*Total.* cwts.
In 1835	6,496	867	= 7,363
1836	4,426	1,911	= 6,337
In 1837	9,157	3,520	= 12,677
1838	9,305	1,911	= 11,216

Composition.—Ginger was analyzed in 1817 by Bucholz (Gmelin's *Handb. d. Chem.*), and in 1823 by Morin (*Journ. de Pharm.* ix. 253).

Bucholz's Analysis.

Pale yellow volatile oil	1·56
Aromatic, acrid, soft resin	3·60
Extractive soluble in alcohol	0·65
Acidulous and acrid extractive, insoluble in alcohol	10·50
Gum	12·05
Starch (analogous to bassorin)	19·75
Apotheme, extracted by potash (ulmin?)	26·00
Bassorin	8·30
Woody fibre	8·00
Water	11·90
White ginger	102·31

Morin's Analysis.

Volatile oil.
Acrid soft resin.
Resin insoluble in ether and oils.
Gum.
Starch.
Woody fibre.
Vegeto-animal matter.
Osmazome.
Acetic acid, acetate of potash, and sulphur.

The ashes contained carbonate and sulphate of potash, chloride of potassium, phosphate of lime, alumina, silica, and oxides of iron and manganese.

Ginger.

1. *Volatile oil of Ginger.*—Is pale yellow, very fluid, lighter than water, odour that of ginger, taste at first mild, afterwards acrid and hot.

2. *Soft resin.*—Obtained by digesting the alcoholic extract of ginger first in water, then in ether, and evaporating the etherial tincture. The residual resin is yellowish brown, soft, combustible, has an aromatic odour, and a burning aromatic taste. Is readily soluble in alcohol, ether, oil of turpentine, and hot almond oil.

Physiological Effects.—Ginger is one of the acrid aromatics, whose effects have been already noticed (*vide* p. 72). Its dust applied to the mucous membrane of the nostrils acts as an irritant, and provokes sneezing. The rhizome chewed is a powerful sialogogue. The powder mixed with hot water, and applied to the skin, causes a sensation of intense heat and tingling. When taken into the stomach it operates as a stimulant; first, to the alimentary canal, secondly, to the body generally; but especially to the organs of respiration. Like some other spices (the peppers, for instance), it acts as an excitant to the genital organs. Furthermore, it is said to increase the energy of the cerebral functions. It is less acrid than pepper.

Uses.—Its principal consumption is as a *condiment*. Its powers in this way are considerable, while its flavour is by no means disagreeable, and its acridity scarcely sufficient to enable it, when taken with food, to irritate or inflame.

As a *stomachic* and *internal stimulant* it serves several important purposes. In enfeebled and relaxed habits, especially of old and gouty individuals, it promotes digestion, and relieves flatulency and spasm of the stomach and bowels. It checks or prevents nausea and griping, which are apt to be produced by some drastic purgatives. It covers the nauseous flavour of many medicines, and communicates cordial and carminative qualities to tonic and other agents. As a *sialogogue* it is sometimes chewed to relieve toothache, relaxed uvula, and paralytic affections of the tongue. As a *counterirritant* I have frequently known a ginger plaster (prepared by mixing together powdered ginger and boiling water, and spreading the paste on paper or cloth) relieve violent headache when applied to the forehead.

Administration.—*Powdered ginger* may be administered, in doses of from ten grains to a scruple or more, in the form of pill. Made into a paste with hot water it may be applied as a *plaster* as already mentioned. *Infusion of ginger*, commonly termed *ginger tea*, is a very useful domestic carminative. It is prepared by digesting from ʒij. to ʒiv. of ginger in f℥vj. of boiling water. The dose of it, when flavoured, is a tablespoonful. *Ginger beer* is a popular and agreeable beverage. The following is an excellent formula for its preparation:—

"Take of White Sugar, lb. xx.; Lemon (or Lime) juice, f℥xviij.; Honey, lb. j.; Ginger bruised, ℥xxij.; Water cong. xviij. Boil the ginger in three gallons of water for half an hour; then add the sugar, the juice, and the honey, with the remainder of the water, and strain through a cloth. When cold, add the White of one Egg and f℥ss. of Essence of Lemons: after standing four days, bottle." This yields a very superior beverage, and one which will keep for many months. Lemon juice may be purchased for sixpence a pint in Botolph Lane, Thames Street.

Preserved ginger (*Conditum Zingiberis indicum*), though commonly used as a sweetmeat, may be taken with advantage as a medicine to stimulate the stomach. *Ginger lozenges*, *ginger pearls*, (commonly termed *ginger seeds*), and *ginger pipe*, are useful articles of confectionary, frequently of benefit in dyspepsia accompanied with flatulence.

1. *Tinctura Zingiberis*, L. E. D.—Ginger, sliced, [in coarse powder, *E. D.*] ℥ijss.; Rectified Spirit, Oij. [wine measure, *D.*] "Macerate for fourteen [seven, *D.*] days, and strain," *L. D.* "Proceed by percolation or digestion, as directed for tincture of cinchona." *Ed.* A very valuable carminative. It is commonly employed as an adjunct to tonic, stimulant, and purgative mixtures. Its dose is fʒj. or fʒij. The tincture, made with proof spirit, becomes turbid by keeping in consequence of the mucilage it contains.

Essence of ginger is prepared as the tincture, except that the quantity of rhizome should be increased. Some preparers of it concentrate the tincture by distilling off part of the alcohol.

2. *Syrupus Zingiberis*, L. E. D.—Ginger, sliced, [bruised, *D.*] ʒijss. [ʒiv. *D.*]; Boiling water, Oj. [Oiij. *wine measure*, D.]; Sugar, lb. ijss. [ʒlxxxvij. *D.*] "Macerate the ginger in the water for four hours, and strain; then add the sugar, and dissolve it," *L.* Used for flavouring. It is scarcely strong enough to be of much value. An extemporaneous syrup may be prepared by adding the tincture of ginger to common

syrup. The *syrupus zingiberis* of the United States Pharmacopœia is made in this way.

Curcu'ma lon'ga, Linn. L. E. D.—*The long-rooted Turmeric.*

Sex. Syst. Monandria, Monogynia.
(Rhizoma, *L. E.* Radix, *D.*)

History.—Turmeric is probably the Κύπειρος Ἰνδικὸς, (*Cyperus indicus*) of Dioscorides (lib. i. cap. iv). Both Dioscorides and Pliny (*Hist. Nat.* lib. xxi. cap. lxx. ed. Valp.) state that this Indian Cyperus has the form of ginger, and that, when chewed, it colours the saliva yellow like saffron. The word *Curcuma* is derived from *Kurkum*, the Persian name for saffron (Royle, *Essay on the Antiq. of Hindoo Med.* p. 87).

Botany. *Gen. Char.*—Tube of the *Corolla* gradually enlarged upwards; limb two-lipped, each three-parted. *Filament* broad. *Anther* incumbent, with two spurs at the base. *Style* capillary. *Capsule* three-celled. *Seeds* numerous, arillate.—Stemless plants, with palmate tuberous roots. *Leaves* with sheathing petioles, bifarious, herbaceous. *Scape* simple, lateral or central. *Spike* simple, erect, comose, somewhat imbricated at the base with bracts or saccate spathes. *Flowers* dull yellow, three to five together, surrounded by bracteolæ. (Blume, *op. cit.*)

Sp. Char.—*Bulbs* small, and with the numerous, long, *palmate tubers*, inwardly of a deep-orange yellow. *Leaves* long-petioled, broad-lanceolar, of a uniform green (Roxburgh).

Hab.—Much cultivated about Calcutta, and in all parts of Bengal, also in China and Cochin-China. One acre yields about 2000 lbs. of the fresh root.

Description.—The *tubers*, called in the shops *turmeric* (*Radix Curcumæ*, seu *Terra Merita*), are distinguished by their place of growth into China, Bengal, and Java turmerics; the first being the best and most valuable. From their shape they are sometimes divided into the *round* and *long*. The first (*Curcuma rotunda*) is round, oval, or ovate, about two inches long, and one inch in diameter, pointed at one end, marked externally with numerous annular wrinkles. The second (*Curcuma longa*) is cylindrical, not exceeding the thickness of the little finger; two or three inches long, somewhat contorted, tuberculated. Both kinds are grayish-yellow externally, internally more or less orange-yellow passing into brown. The fractured surface has a waxy appearance. The odour is aromatic, somewhat analogous to ginger, but peculiar: the taste is aromatic. When chewed it tinges the saliva yellow. Its powder is orange-yellow. The tubers are frequently worm-eaten.

Composition.—Two analyses of turmeric have been made: one by John (Gmelin's *Handb. d. Chem.*), and a second by MM. Vogel and Pelletier (*Journ. d. Pharm.* i. 289).

John's Analysis.

Yellow volatile oil	1
Curcumin	10 to 11
Yellow extractive	11 to 12
Gum	14
Woody fibre	57
Water and loss	7 to 5
Turmeric	100

Vogel and Pelletier's Analysis.

Acrid volatile oil.
Curcumin.
Brown colouring matter.
Gum (a little).
Starch.
Woody fibre.
Chloride of calcium.

Turmeric.

Curcumin: Yellow Colouring Matter.—Is obtained, mixed with some volatile oil and chloride of calcium, by digesting the alcoholic extract of turmeric in ether, and evaporating the etherial tincture to dryness. In the mass, *curcumin* is brownish-yellow, but when powdered it becomes full yellow. It is tasteless, odourless, almost insoluble in water, but readily soluble in alcohol and ether. These properties shew that it is of a resinous nature. The alkalies colour it reddish-brown, and readily dissolve it. The alcoholic solution, evaporated with boracic acid, becomes red. Hydrochloric acid also reddens it. The alcoholic solution of curcumin produces coloured precipitates with several salts, as acetate of lead and nitrate of silver.

Characteristics.—The alkalies change an infusion of turmeric, or turmeric paper, to reddish-brown. A similar alteration of colour occurs when turmeric paper is exposed to the vapour of hydrochloric acid gas, or is touched with oil of vitriol. If to tincture of turmeric boracic acid be added, and the mixture be evaporated to dryness, an orange-red residue is obtained, whereas, without the acid, the residue is yellow. Sulphate of copper causes a yellowish precipitate with an infusion of turmeric. A similar effect is produced by sesquichloride of iron.

Physiological Effects.—Are those of a mild aromatic, *vide* p. 72. The colouring matter becomes absorbed, and communicates a yellow tinge to the urine (Lewis, *Mat. Med.*; and Reiger, quoted by Murray, *App. Med.* vol. v. p. 78). According to Mr. Gibson (*Mem. of the Lit. and Phil. Soc. of Manchester*, vol. i. Sec. Ser. p. 148), the colouring matter of turmeric is somewhat changed by the digestive organs; for the stools of animals fed with this root were green, whilst either logwood or madder exhibited its respective hues after passing through the intestines.

Uses.—Employed as a condiment, colouring ingredient, and test. It is a constituent of the well-known *curry powder* and *curry paste*, and of many other articles of Indian cookery. Formerly it had some reputation in hepatic and other visceral diseases, and especially in jaundice. As a test it is used to detect the presence of free alkalies, which change its yellow colour to reddish-brown. But some acids, and several salts, produce the same effect on it. *Turmeric paper* is prepared with white, bibulous, or unsized paper, which is to be brushed over with, or soaked in, a decoction of turmeric (prepared by boiling one ounce of the coarsely-powdered rhizome in ten or twelve ounces of water, straining through a cloth, and allowing the fluid to settle for a minute or two), and drying in the air, the access of alkaline and acid fumes being prevented (Faraday, *Chem. Manipulation*).

Curcu'ma angustifo'lia, Roxburgh.—*The narrow-leaved Turmeric.*

(Fecula tuberis. East Indian Arrow-root, *Offic.*)

History.—This plant was found by H. T. Colebrook, Esq. in the forests extending from the banks of the Sona to Nagpore, and was by him introduced into the Botanic Garden at Calcutta (Roxburgh, *Fl. Indica*).

Botany. *Gen. Char.*—Vide *Curcuma longa*.

Sp. Char.—*Bulb* oblong, with pale, oblong, pendulous *tubers* only. *Leaves* stalked, narrow-lanceolate. *Flowers* longer than the bracts.

Hab.—East Indies: from the banks of the Sona to Nagpore. The fecula obtained from its tubers is sold in the markets of Benares, and is eaten by the natives (Roxburgh, *op. cit.*) Grows also in abundance on the Malabar coast, where, especially at Travancore, large quantities of fecula are extracted from the tubers (Ainslie, *Mat. Indica*, i. 19).

Description.—Under the name of *East Indian Arrow-root* I have found in commerce two kinds of fecula, both of which are imported from Calcutta.

a. White East Indian Arrow-root.—A fine white powder, readily distinguishable, both by the eye and the touch, from West Indian Arrow-root. To the eye it somewhat resembles a finely-powdered salt (as bicarbonate of soda or Rochelle salt). When pinched or pressed by the fingers, it wants the firmness so characteristic of West Indian Arrow-root, and it does not crepitate to the same extent when rubbed between the fingers.

β. Pale Buff-coloured East Indian Arrow-root.—In the form of powder, or of pulverulent masses, which are dirty or buffy white. Paddy husks, woody fibre, and various impurities, are intermixed.

To the microscope both kinds present the same appearance, from which it is probable that they are obtained from the same plant, but with unequal degrees of care. However, this is somewhat doubtful, as Dr. Roxburgh (*Fl. Indica*, vol. i. p. 29) says that a fecula, like arrow-root, is procured from several species of *Curcuma*, (as *C. rubescens* and *C. leucorrhiza*; the fecula of the latter is called *Tikor*). The particles of East Indian arrow-root are very unequal in size, but on the average larger than those of West Indian arrow-root. They are compressed ovate disks, frequently with little processes given off from their sides or pointed extremity. At their larger end there are faint indications of rugæ analogous to those of potatoe starch.

Composition.—Not ascertained, but doubtless analogous to that of West Indian arrow-root.

Effects and Uses.—Analogous to those of the West Indian fecula. Its commercial value, however, is very much below that of the latter. It is bought by starch-makers, and, therefore, is employed, I presume, in making starch.

Amo'mum Cardamo'mum, Linn.—*The Cluster or Round Cardamom.*

Sex. Syst. Monandria, Monogynia.

(Fructus. Cardamomum rotundum, *Offic.*)

History.—The fruit of this plant is the Ἄμωμον of Dioscorides (lib. i. cap. 14), the *Amomi uva* of Pliny (*Hist. Nat.* lib. xii. cap. 28, ed. Valp.)

Botany. *Gen. Char.*—*Inner limb of the corolla* one-lipped. *Filament* dilated beyond the anther, with an entire or lobed crest. *Capsule* often berried, three-celled, three-valved. *Seeds* numerous, arillate.—*Herbaceous perennials*, with articulated creeping *rhizomes*. *Leaves* in two rows, membranous, with their sheaths split. *Inflorescence* spiked, loosely imbricated, radical. (Blume, *op. cit.*)

Sp. Char.—*Leaves* with short petioles, lanceolate. *Spikes* half immersed in the earth, loosely imbricated with villous, lanceolate, acute, one-flowered *bracts*. *Lip*, with the anterior margin, three-lobed. *Crest* three-lobed. (Roxburgh.)

Hab.—Sumatra, Java, and other islands eastward to the Bay of Bengal.

Description.—The fruit of this plant is the *round cardamom* (*cardamomum rotundum*) of the shops. It varies in size from that of a black currant to that of a cherry. It is roundish or roundish-ovate, with three convex, rounded sides or lobes, more or less striated longitudinally, yellowish or brownish-white, sometimes with a red tint, and when examined by a pocket lens shews the remains of hairs, the greater part of which have been probably rubbed off. The seeds are brown, angular, cuneiform, shrivelled, with an aromatic, camphoraceous flavour. It is rare to meet with the fruits in their native clusters or spikes (constituting the *Amomum racemosum*): a fine sample is in the Sloanian collection of the British Museum.

Fig. 123.

Round Cardamom.

Composition.—It has not been analysed. Its constituents are probably analogous to those of the Malabar cardamom (*Elettaria Cardamomum*).

Effects and Uses.—Similar to those of the Malabar cardamom. Round cardamoms are rarely employed in this country. They are officinal in the French Codex, and are principally consumed in the southern parts of Europe. The seeds are directed to be used by the Dublin Pharmacopœia, but I presume those of the Elettaria Cardamomum are meant.

Amomum, Blume.—*One or two species yielding Grains of Paradise.*

History.—Afzelius (*Remed. Guineens.* x. n. 1, quoted in the *Beschreib. offic. Planz* of Nees, &c.) refers the seeds called, in the shops, *grains of paradise*, and which he says are the *true Malaguetta pepper*, to his *Amomum Granum Paradisi* (*A. Grana-paradisi* of Smith in *Rees' Cyclop.* vol. xxiii. art. "*Mellegetta*)." Roscoe (*Monandrian Plants*), on the other hand, asserts most positively, that Malaguetta pepper is the produce of his *Amomum Melegueta*, which he considers to differ from any previously-described plant. I strongly suspect the seeds of at least two species have been confounded in commerce, under the names of *grains of paradise* or *Malaguetta pepper*. Afzelius (*Sierra Leone Company's Report* in 1791, 8vo. p. 173) states that there are four sorts of Malaguetta pepper, viz. *Mabooboo*, *Massa aba*, *Massa amquona*, and *Tossan*, the last being the native and true one; but Sir J. E. Smith (*Rees' Cyclop.* vol. xxxix. art. *Amomum*) has shewn that the two first of these are distinct species; *Maboobo* being *A. macrospermum*, Smith, and *Massa aba* being *A. strobilaceum*, Smith.

Botany. *Gen. Char.*—Vide Amomum Cardamomum.

Species.—1. *A. Grana-paradisi*, Smith.

Rhizome perennial, woody, creeping horizontally. *Stems* erect, simple, slender, three feet high, leafy, but destitute of flowers. *Leaves* numerous, crowded, two-ranked, alternate, a span long and an inch broad, lanceolate, or slightly ovate, with a long taper point, entire, smooth, single-ribbed, striated with innumerable oblique veins. Their flavour is slightly aromatic, after having been dried 20 years. *Foot-stalks* sheathing, linear, very long, smooth, striated. *Flower-stalks* radical, solitary, an inch or two in length, ascending, clothed with numerous, close, sheathing *bracts*, all abrupt, ribbed, somewhat hairy and fringed; the lower ones very short; the upper gradually much larger. Of the parts of the flower nothing could be made out in Sir J. Smith's specimens [Afzelius (*Beschr. offic. Planz.*) declares them to be formed like those of

A. exscapum, Sims]. *Capsule* an inch and half long, half an inch in diameter, oblong, bluntly triangular, scarcely ovate, beaked, of a dark reddish-brown, ribbed, coriaceous, rough, with minute deciduous bristly hairs. When broken it is very powerfully aromatic, even after being kept twenty years, with a peculiar pepper-like flavour, rather too strong to be agreeable. *Seeds* numerous, enveloped in membranes formed of the dried pulp, roundish or somewhat angular, of a shining golden brown, minutely rough or granulated, extremely hot and acrid (Smith). Native of Guinea, about Sierra Leone.

2. *A. Melegueta*, Roscoe.

Stem erect, six feet high. *Leaves* two-ranked, subsessile, narrow-lanceolate. *Scape* radical, covered at the base with about seven imbricated, ovate, concave, pointed, and somewhat cuspidate *bracts*. *Calyx* cylindrical, of one leaf, green, spotted with red. *Flowers* cylindrical, expanding in a double border; outer border in three sections, the middle section largest, ovate, the two others linear and opposite; inner lip very large, broad-ovate, crenate, pale yellow at the base, crimson at the margin. *Filament* strong, erect, clavate, terminating in three lobes, middle lobe erect and bifid, the other two pointed and recurved; a pair of hornlets on the filament, near the base of the lip. *Anther* in two lobes, seated in front of the filament, a little below the apex, bright yellow. *Style* erect, tubular, expanding into a dilated *stigma* or cup, supported at the base by two linear *processes*, about an inch in length, and one-eighth of an inch in breadth, by much the largest specimen of this part observable in any scitamineous plant. *Capsule* cylindrical, coriaceous, six inches long, yellow, spotted with orange, supported at the base by the large ovate, concave, cuspidate bracts, and containing a columella or receptacle about four inches long, covered with *seeds* beautifully arranged, arilled, and imbedded in a tomentose substance. Seeds angular, light brown, with a highly aromatic and grateful flavour (Roscoe). Cultivated at Demerara: probably from Africa.

Description.—In the Sloanian Collection of the British Museum are several capsules of Malaguetta pepper, one of which is labelled "*Melegetta, a pod from Guinea.*" (Fig. 124 is taken from one of these). They are two and a half inches long, and one inch in diameter, ovate or ovate-oblong, coriaceous, wrinkled as if shrivelled, yellowish-brown. The seeds are identical with those called, in the shops, *Guinea grains*, or *grains of paradise*. Are these capsules the fruit of *A. Melegueta*, Roscoe?

Fig. 124.

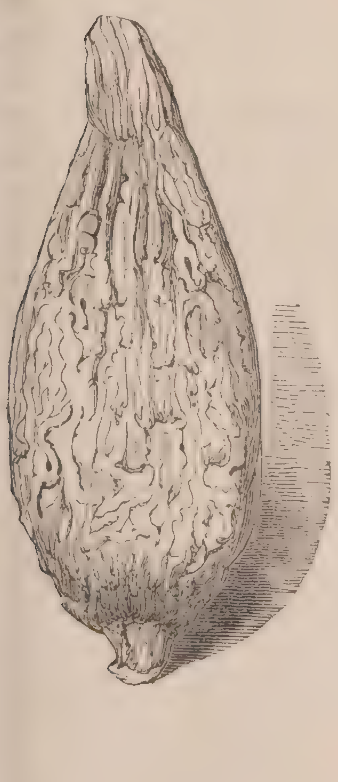


Fig. 125.

Capsules of Malaguetta Pepper.

In Dr. Burgess's collection of Materia Medica, in the College of Physicians, is a capsule smaller than the preceding, oval or oval-oblong, somewhat reddish-brown, wrinkled longitudinally. (Fig. 125 is taken from it.) The seeds very closely resemble, if they be not identical with, the grains of paradise of the shops. They have also the same vehemently hot taste. This capsule appears to me to be the fruit of *A. Grana paradisi*, Smith.

The seeds, called in the shops *grains of paradise* (*grana paradisi*), or *Guinea grains*, are roundish or ovate, frequently bluntly angular, and somewhat cuneiform; shining golden brown; minutely rough, from small warts and wrinkles; internally white. Their taste is aromatic and vehemently hot or peppery: when crushed and rubbed between the fingers their odour is feebly aromatic. Their greatest diameter rarely exceeds 1¼ lines. The acrid taste resides in the seed coats.

Commerce.—Grains of paradise are imported in casks, barrels, and puncheons, from the coast of Guinea. The quantities on which duty (two shillings *per lb.*) has been paid during the last four years, is as follows (*Trade List*):—

In 1835	14,603 lbs.	In 1837	17,134 lbs.
1836	16,234	1838	16,199

"*Extract or preparation of Guinea grains*" is mentioned by Frewin (*Digested Abridgm. of the Laws of the Customs*, 1819) in his table of *Imports*, as paying a duty of two shillings *per lb.*

The heavy duty imposed on grains of paradise is intended to act as a prohibition of their use. (*Fourth Report of the African Institution*, p. 16.)

Composition.—Grains of paradise were analyzed in 1811 by Willert (*Trommsdorff's Journ.* xx. St. 2, 1811), who obtained the following results:—*Volatile oil* 0·52, *acrid resin* 3·40, *extractive* 1·27, *tragacanthin* and *woody fibre* 82·8 [? *water and loss* 12·01].

1. The *volatile oil* has a light yellow colour, a camphoraceous smell, and a hot penetrating taste.
2. The *resin* is brown, soft, odourless, and has an acrid, burning taste.

Physiological Effects.—Analogous to those of pepper. A very erroneous notion prevails that these seeds are highly injurious. (Roscoe, *op. cit.*)

Uses.—Rarely employed as an aromatic. Esteemed in Africa as the most wholesome of spices, and generally used by the natives to season their food.—(*Fourth Report of the African Institution.*)

Its principal consumption is in veterinary medicine, and to give an artificial strength to spirits, wine, beer, and vinegar. By 56 *Geo.* III. *c.* 58, no brewer or dealer in beer shall have in his possession or use grains of paradise, under a penalty of £200 for each offence: and no druggist shall sell it to a brewer, under a penalty of £500 for each offence.

Amo'mum angustifo'lium, Sonnerat.—*The Greatest* or *Madagascar Car'damom.*

Amomum madagascariense, *Lamarck*.

This species is a native of Madagascar, growing in marshy ground, and was first described by Sonnerat (*Voyage aux Indes*, t. ii. p. 242). Its fruit is the *cardamomum majus* of Matthiolus (*Comment. in* vi. *lib. Diosc.* Venet. 1583), Geoffroy (*Mat. Méd.* ii. 366), Smith (*Rees' Cyclop.* art. *Mellegetta*), and Geiger (*Handb. d. Pharm.* Bd. ii.) In Dr. Burgess's Collection of Materia Medica at the College of Physicians, there are several fine specimens (from one of which the accompanying figure, 126, was taken), marked "*Cardamomum maximum Matthioli.*"

Fig. 126.

Madagascar Cardamom.

The capsule is ovate, pointed, flattened on one side, striated, with a broad, circular umbilicus or scar at the bottom, around which is an elevated, notched, and corrugated margin. Some authors, who have mistaken the base of the capsule for its summit, have compared the shape to that of a fig.

The seeds are rather larger than grains of paradise, roundish or somewhat angular, abrupt at the base, olive-brown, with an aromatic flavour analogous to that of the Malabar cardamom, but totally devoid of the vehemently hot acrid taste of the grains of paradise.

Amo'mum Clu'sii, Smith.—*Long-seeded Amo'mum.*

I have received from a druggist a capsule (fig.127), which agrees with one noticed, and figured by Clusius (*Exoticorum*, pp. 37, 38.) Another specimen is described by Sir J. E. Smith (*Rees' Cyclop.* vol. xxiii. art. *Mellegetta*, and vol. xxxix. *Addenda*, art. *Amomum.*) This capsule must be confounded neither with that of the Madagascar cardamom, nor with that of the grain of paradise. It is ovate, pointed, slightly triangular, cartilaginous, striated, smooth, yellowish [reddish, *Smith*] brown. The seeds distinguish it from all other species: they are oblong or ovate, inclining to cylindrical, dark-brown, highly polished, as if varnished; with a pale yellowish-brown, corrugated, and notched margin surrounding the scar. They are very slightly aromatic.

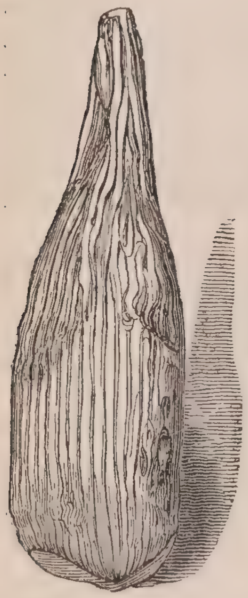
Fig. 127.

Amomum Clusii.

Amo'mum macrosper'mum, Smith.—*Large-seeded Guinea Amo'mum.*

Zingiber Melegueta, *Gærtner*. Mabooboo, *Afzelius*. Banda Cardamom, *Th. Martius*.

Fig. 128.



Amomum macrospermum.

This was mistaken by Gærtner for Malaguetta pepper. The *capsule* is ovate, pointed, somewhat striated, about two inches long, and six lines broad, with a corrugated beak. *Seeds* ovate, or nearly globular, or somewhat oblong, scarcely larger than grains of paradise, smooth, polished, greenish-grey, or lead-coloured, with a strong umbilicated scar at their base, with a whitish or pale-yellow margin; flavour slightly aromatic. A native of Sierra Leone. (Fig.128 is from a specimen in the Sloanian Collection of the British Museum).

Amo'mum max'imum, Roxburgh.—*The Great-winged Amo'mum.*

(Fructus: Java Cardamom, *offic.*)

History.—This plant was first described by Roxburgh (*Asiatic Researches*, xi. p. 344). That it yields the *Java cardamom* of commerce I entertain but little doubt; for the latter agrees precisely with the characters assigned by Roxburgh and Blume (*Enum. Pl. Javæ*) to the fruit of this plant, the seeds of which, the first of these botanists says, "are aromatic, and pass for a sort of cardamom" (*Fl. Indica*, vol. i. p. 44, 1832). Moreover, *Amomum maximum*, being a native of Java, accounts for its fruit being called in commerce the *Java* cardamom. Lastly, no other plant noticed in the works of Roxburgh and Blume agrees precisely in the characters of its fruit with the cardamom in question.

Elettaria cardamomum medium, Roxburgh, which I at one time (*Lond. Med. Gaz.* vol. xviii. p. 633), with some other botanists, fancied might be the parent plant, disagrees in several respects: the shape and size of its fruit, the inequality of its wings, and the qualities of its seed coats, are the most essential points of disagreement. The fruit of *Amomum aromaticum* (Dr. Roxburgh's drawing of which was kindly shewn me by Dr. Horsfield) has no resemblance to the Java cardamom. Lastly, I have examined the fruits of *Amomum grandiflorum*, *A. Afzelii*, and *A. dealbatum* [a specimen of the latter in the British Museum is erroneously marked A. maximum], in the collections of the Linnæan Society and the British Museum, and find that none of them are the Java cardamom.

Botany. *Gen. Char.*—Vide Amomum Cardamomum.

Sp. Char.—*Leaves* stalked, lanceolate, villous underneath. *Spikes* oval, even with the earth. *Bracts* lanceolate. *Lip* elliptical. *Coronet* of one semilunar lobe. *Capsules* round, nine-winged. (Roxburgh.)

The *capsule* is "almost globular, size of a gooseberry, three-celled, three-valved, ornamented with nine [seven to thirteen, *Blume*], firm, short, ragged (when old and dry), membranaceous wings. The *seeds* possess a warm, pungent, aromatic taste, not unlike that of cardamoms, but by no means so grateful" (Roxburgh.) The *Nepal cardamom*, described by Dr. Hamilton (*An Account of the Kingdom of Nepal*, ed. 1819,) is unquestionably identical with the Java cardamom. Dr. Hamilton says, the plant yielding it "is a species of *Amomum*, as that genus is defined by Dr. Roxburgh, and differs very much from the cardamom of Malabar."

Hab.—The Malay Islands (Roxburgh); Java (Blume). Cultivated in the mountainous parts of Nepal, where it is propagated by cuttings of the root [rhizome]; the plants yield in three years, and afterwards give an annual crop (Hamilton).

Description.—*Greater Java Cardamoms* (*Cardamomi majores javaenses*, Th. Martius; *Java Cardamoms*, offic.; *Nepal Cardamons Desi Elachi* of Hindustan, Hamilton; the *Bura Elachee* [i. e. *Great Cardmons*] of Saharunpore,—the *Bengal Cardamons* of the Calcutta market, Royle; *Cardamome Fausse-Maniguette*, Guibourt) are oval or oval-oblong, frequently somewhat ovate, three-valved, from eight to fifteen lines long, and from four to eight lines broad, usually flattened on one side, convex on the other, occasionally curved, sometimes imperfectly three-lobed, and resembling in their form the pericarp of the cocoa-nut. Their colour is dirty greyish-brown. They have a coarse, fibrous, aged appearance; are strongly ribbed, and when soaked in hot water become almost globular, and present from nine to thirteen ragged, membranous wings, which occupy the upper half or three-fourths of the capsule, and are scarcely perceptible in the dried state of the pericarp. By the possession of wings, these cardamoms are distinguished from all others of commerce, and hence might be called the *winged cardamoms*.

Fig. 129.

Java Cardamom, with its foot-stalk.

Occasionally the footstalk is attached, with, now and then, portions of brown, membranous, imbricated scales, as long as the fruit. At the opposite or winged extremity of the capsule are frequently the fibrous remains of the calyx. Seeds somewhat larger than grains of paradise, dull, dirty brown, with a shallow groove on one side, internally white; taste and odour feebly aromatic. One hundred parts of the fruit consist, according to Th. Martius (*Pharmakogn.*), of seventy parts seeds, and thirty parts pericarpial coats. They are imported from Calcutta in bags.

Composition.—Analogous probably to that of the Malabar cardamom, except in the quantity of volatile oil which it yields; for Martius procured only four scruples of it from a pound of the fruit. The oil obtained was white and thickish.

Effects and Uses.— Java cardamoms are not used here. They are of very inferior quality, and when brought to this country are usually sold in bond for continental use. A few months since a quantity of them was sold at seven-pence *per lb.*

Eletta'ria Cardamo'mum, Maton.—*The True* or *Officinal Car'damom.*

Alpinia Cardamomum, *Roxb. L.*—Renealmia Cardamomum, *Ed.*—Amomum Cardamomum, *D.*
Sex. Syst. Monandria, Monogynia.
(Semina, *L. D.*—The fruit; Cardamoms, *Ed.*)

History.—A medicine, called cardamom (Καρδαμώμον), is mentioned by Hippocrates (pp. 265, 572, 603. 651, ed. Fœs.), Theophrastus (*Hist. Plant.* lib. ix. cap. vii.), and Dioscorides (lib. i. cap. 5), the first of whom employed it in medicine. But it is now scarcely possible to determine what substance they referred to, as their notices of it are so brief and imperfect, though I believe it to have been one of the fruits which we call cardamoms. Pliny (*Hist. Nat.* lib. xii. cap. xxix. ed. Valp.) speaks of four kinds of cardamoms, but it is almost impossible to ascertain with any certainty what species he refers to.

Botany. *Gen. Char.*—The same as that of Amomum, but the *tube of the corolla* filiform, and the *anther* naked (Blume.)

Sp. Char.—*Leaves* lanceolate, acuminate, pubescent above, silky beneath. *Spikes* lax. *Scape* elongated, horizontal. *Lip* indistinctly three-lobed (Blume.)

Rhizome with numerous fleshy fibres. *Stems* perennial, erect, smooth, jointed, enveloped in the spongy sheaths of the leaves; from six to nine feet high. *Leaves* subsessile on their sheaths, entire; length from one to two feet. *Sheaths* slightly villous, with a roundish ligula rising above the mouth. *Scapes* several (three or four) from the base of the stems, flexuose, jointed, branched, one to two feet long. *Branches* or *racemes* alternate, one from each joint of the scape, suberect, two or three inches long. *Bracts* solitary, oblong, smooth, membranaceous, striated, sheathing, one at each joint of the scape. *Flowers* alternate, short-stalked, solitary at each joint of the racemes, opening in succession as the racemes lengthen. *Calyx* funnel-shaped, three-toothed at the mouth, about three-quarters of an inch long, finely striated, permanent. Tube of *corolla* slender, as long as the calyx; limb double, exterior of three, oblong, concave, nearly equal, pale greenish white divisions; inner lip obovate, much larger than the exterior divisions, somewhat curled at the margin, with the apex slightly three-lobed, marked chiefly in the centre, with purple violet stripes. *Filament* short erect: *anther* double emarginate. *Ovary* oval, smooth: *style* slender: *stigma* funnel-shaped. *Capsule* oval, somewhat three-sided, size of a small nutmeg [!], three-celled, three-valved. *Seeds* many, angular. (Roxburgh.)

Production.—Cardamoms are produced naturally or by cultivation. Between Travancore and Madura they grow without cultivation. (Hamilton [Buchanan], *Journey through Mysore, Canara, and Malabar*, vol. ii. p. 336); and also at certain places in the hills which form the lower part of the Ghaûts in Cadutinada and other northern districts of Malayata (Hamilton, *op. cit.* vol. ii. p. 510). The cardamoms of the Wynaad, which are esteemed the best, are cultivated: the spots chosen for the cardamom farms are called *Ela-Kandy*, and are either level or gently-sloping surfaces, on the highest range of the Ghaûts after passing the first declivity from their base (White, *Trans. of Linn. Soc.* vol. x. p. 237). "Before the commencement of the periodical rains, in June, the cultivators of the cardamom ascend the coldest and most shady sides of a woody mountain; a tree of uncommon size and weight is then sought after, the adjacent spot is cleared of weeds, and the tree felled close at its root. The earth, shaken and loosened by the force of the fallen tree, shoots forth young cardamom plants in about a month's time." (Capt. Dickson, in Roxburgh's *Fl. Indica.*)

The quantities of cardamoms brought for sale at Malabar is about 120, or, according to another account, only 100 candies, from the following places (Hamilton, *op. cit.* vol. ii. p. 538) :—

	Candies of 640 lbs.	Candies of 640 lbs.
Coorg	40	30
Wynaad	57	65
Tamarachery	20	3
Cadutinada or Cartinaad	3	2
	120	100

The cardamoms of the Wynaad are shorter, fuller of seed, and whiter than those of Malabar, and sell for 100 rupees a candy more. Those of Coorg have fewer fine grains, but they have also fewer black or light ones. The cardamoms of Sersi (western part of Soonda) are inferior to those of Coorg (Hamilton, *op. cit.* vol. ii. p. 538, and vol. iii. p. 228).

DESCRIPTION.—The fruit of the *Elettaria Cardamomum* constitutes the *small*, *officinal*, or *Malabar cardamom* (*cardamoms*, Ed.; *cardamomum minus*, Clusius, Matthiolus, Bontius, Geoffroy, Dale, Geiger, Th. Martius, and Guibourt; *cardamomum malabarense*). It is an ovate-oblong, obtusely triangular capsule, from three to ten lines long, rarely exceeding three lines in breadth; coriaceous, ribbed, grayish or brownish-yellow. It contains many, angular, blackish or reddish-brown, rugose seeds (*cardamomum*, L.; *cardamomum excorticatum*, offic.), which are white internally, have a pleasant aromatic odour, and a warm, aromatic, agreeable taste. [For some drawings of the minute structure of the seeds, vide Bischoff's *Handb. d. botanic. Terminal.* Tab. xliii. fig. 1876 and 1954]. 100 parts of the fruit yield 74 parts of seeds and 26 parts of pericarpial coats (Th. Martius, *Pharmakogn.*)

Three varieties of Malabar cardamoms are distinguished in commerce, viz. *shorts*, *short-longs* and *long-longs*.

FIG. 130.

a b c

Malabar Cardamoms.

a. shorts.
b. short-longs.
c. long-longs.

α. *Shorts: Malabar cardamoms properly so called; Petit cardamome* (Guib.); ?*Wynaad cardamom* (Hamilton); ?? *Prima species Elettari planè rotunda et albicans* (Rheede, pars xi. tab. 4, 5, and 6).—From three to six lines long, and from two to three lines broad; more coarsely ribbed, and of a browner colour than the other varieties. This is the most esteemed variety.

β. *Short-longs: ? Secunda species Elettari oblongior sed vilior* (Rheede).—Differs from the third variety only in being somewhat shorter and less acuminate.

γ. *Long-longs: Moyen cardamome* (Guib.); ?? *Tertia species Elettari vilissima et planè acuminata* (Rheede).—From seven lines to an inch long, and from two to three lines broad: elongated, somewhat acuminate. This, as well as the last variety, is paler and more finely ribbed than var. α. *shorts.* The seeds also are frequently paler (in some cases resembling those of the Ceylon cardamom) and more shrivelled.

COMPOSITION.—The small cardamom was analysed by Trommsdorf, in 1834 (*Journ. de Chim. Méd.* t. i. p. 196, 2ⁿᵈᵉ Sér.) He obtained the following results:—*Essential oil* 4·6, *fixed oil* 10·4, *a salt of potash* (*malate*?) combined with *a colouring matter* 2·5, *fecula* 3·0, *nitrogenous mucilage* with *phosphate of lime* 1·8, *yellow colouring matter* 0·4, and *woody fibre* 77·3.

1. *Volatile* or *Essential Oil of Cardamom.*—Is obtained from the seeds by distilling them with water. 56 lbs. of good short Malabar cardamoms yielded, at one operation, about f℥viss. of oil for every *lb.* of fruit (*Private Information*). It is colourless, has an agreeable odour, and a strong, aromatic, burning taste. Its sp. gr. is 0·943. It is very soluble in alcohol, ether, oils (both fixed and volatile), and acetic acid. It is insoluble in potash-ley. By keeping, it becomes yellow, viscid, and loses its peculiar taste and smell. It then detonates with iodine, and takes fire when placed in contact with concentrated nitric acid. On this oil depends the odour, flavour, and aromatic qualities of the seeds. Its composition is analogous to that of oil of turpentine, being $C^{10} H^{8}$.

2. *Fixed Oil of Cardamom.*—Is soluble in alcohol, ether, and the oils, both fixed and volatile. Nitric acid, assisted by heat, reddens it. It has some analogy to castor oil.

Physiological Effects.—The effects of cardamoms are those of a very agreeable and grateful aromatic, devoid of all acridity. (See the effects of the *Aromata*, p. 72.)

Uses.—Cardamoms are employed partly on account of their flavour, and partly for their cordial and stimulant properties. They are rarely administered alone, but generally either as adjuvants or correctives of other medicines, especially of stimulants, tonics, and purgatives.

Administration.—Though cardamoms enter into a considerable number of pharmaceutical compounds, only two preparations derive their names from these seeds. They are the following:—

1. Tinctura Cardamomi, L. E.—(Cardamom seeds, bruised, ℥iijss. [℥ivss. *Ed.*]; Proof Spirit, Oij. Macerate for fourteen [seven, *Ed.*] days, and strain. "This tincture may be better prepared by the process of percolation, in the same way with the tincture of capsicum, the seeds being first ground in a coffee-mill," *Ed.*) This compound is agreeably aromatic. It is used as an adjunct to cordial, tonic, and purgative mixtures. Dose, f℥j. to f℥ij.

2. Tinctura Cardamomi composita, L. E. D.—(Cardamom seeds, bruised; Carraway seeds, bruised, of each ʒijss. [ʒij. *D.*]; Cochineal, powdered, ʒj.; Cinnamon, bruised, ʒv. [℥ss. *D.*]; Raisins [stoned,] ℥v.; Proof Spirit, Oij. Macerate for fourteen [seven, *Ed.*] days, and filter. "This tincture may also be prepared by the method of percolation, if the solid materials be first beat together, moistened with a little spirit, and left thus for twelve hours before being put into the percolator," *Ed.* The *Dublin College* omits the cochineal and raisins.) This tincture is used for the same purposes and the same doses as the former preparation, over which it has the advantage of a more agreeable flavour. Moreover, its colour often renders it useful in prescribing.

Eletta'ria Cardamo'mum Zeylan'icum, Pereira.—*The Ceylon Eletta'ria.*

Elettaria major, *Smith.*

(Fructus: Ceylon Cardamom, *Offic.*)

History.—This cardamom was known to Clusius (*Exot.* p. 187), and is mentioned by most subsequent pharmacologists.

Botany.—The plant has not yet been described; and it is somewhat doubtful whether it be a variety of, or a species distinct from, *Elettaria Cardamomum*, Maton. From an examination of the fruits of commerce Sir J. E. Smith (*Rees' Cyclop.* vol. xxxix.) was satisfied that it was a species of Elettaria. The same opinion has also been expressed by Nees and Ebermaier (*Hand. d. med. pharm. Bot.* i. 253). Dr. Lindley, who at my request examined the fruits, concurs in this view*.

Bertolacci (*Agricult. Commerc. and Financ. Interests of Ceylon*, p. 157, 1817) says the Ceylon cardamom is collected chiefly in the Candian territory, and that he was informed it is not indigenous, but was introduced by the Dutch. The quantity exported from 1806 to 1813 inclusive varied from $4\frac{1}{2}$ to 18 candies annually. Percival (*Account of Ceylon*, 1805) states that cardamoms grow in the south-east part of Ceylon, particularly in the neighbourhood of Matura. I am informed that occasionally they come from Quillon.

Fig. 131.

Ceylon Cardamom, with the fruit-stalk attached.

Description.—The *Ceylon cardamom* (*cardamomum zeylanicum; cardamomum medium*, Matth. and Geoffr.; *cardamomum majus*, Bont. and Dale; *cardamomum majus vulgare*, Clusius; *cardamomum majus officinarum*, C. Bauhin; *cardamomum longum*, Th. Martius and Geiger; *grande cardamome*, Guib.) is a lanceolate-oblong capsule, acutely triangular, more or less curved, with flat and ribbed sides, about an inch and a half long and one-third of an inch broad. At one extremity we frequently find the long, cylindrical, permanent, three-lobed calyx; at the other, the fruit-stalk, which is sometimes branched. The pericarp is coriaceous, tough, brownish or yellowish ash-coloured, three-celled. The seeds are angular, rugged, have a yellowish red tinge, a fragrant and aromatic but peculiar odour, and a spicy flavour. The long diameter of the vitellus is parallel to that of the embryo. Dr. Lindley thinks that Ceylon cardamoms "owe their bad quality to not being ripe when gathered." Th. Martius (*Pharmakogn.*) says that 100 part of these fruits yield 71 parts of seeds, and 29 parts of pericarpial coats.

Composition, Effects, and Uses.—Ceylon cardamoms have not been analysed. Their constituents, as well as their effects and uses, are doubtless analogous to those of the Malabar cardamom. Their commercial value is about one-third that of the latter.

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* After I had corrected the proof of this sheet I received a collection of plants from Ceylon, made by my much lamented friend and pupil, the late Mr. Frederick Saner, Assistant Surgeon in her Majesty's 61st regt. It contains three Scitamineous plants, viz. *Alpinia calcarata*, Roscoe, *Elettaria Cardamomum*, Maton, and *Elettaria Cardamomum zeylanicum*, Pereira; all of which appear to have been furnished by Mr. Lear, Acting Superintendent of the Royal Botanic Gardens in Ceylon. It is somewhat remarkable, however, that the last-mentioned species is erroneously designated by Mr. Lear, "*Alpinia* (Amomum) *Granum paradisi*." Doubtless the same error has been made by Mr. Moon, the Superintendent of the Royal Botanic Gardens at Ceylon, in his *Catalogue of the Indigenous and Exotic Plants growing in Ceylon*: Colombo, 1824. For he gives *Ensal* as the Singhalese name of "Amomum Granum paradisi," and says the plant is cultivated at Candy. Now Hermann (*Mus. Zeyl.* 66) states that *Ensal* is the Singhalese name of the Ceylon cardamom, which I have above shewn is cultivated at Candy. Furthermore, if the true grain of paradise plant be really cultivated in Ceylon, it is somewhat extraordinary that none of its seeds are brought from thence here. The following is a description of the Ceylon cardamom plant in my possession:—

Rhizome with numerous fibres. *Stem* erect, smooth, enveloped by leaf sheaths. *Leaves* sessile on their sheaths, silky beneath, acuminate; the shorter ones lanceolate, the larger ones oblong-lanceolate; breadth 2 to 3 inches, length not exceeding $15\frac{1}{2}$ inches. *Sheaths* about half the length of the leaves, with a roundish ligula. *Scape* from the

Other Medicinal Zingiberaceæ.

Galan'gal root (*radix galangæ*, offic.) of English druggists, occurs in pieces which are as thick as the finger, seldom exceeding three inches in length, cylindrical or somewhat tuberous, often forked, sometimes slightly striated longitudinally, and marked with whitish circular rings. Externally its colour is reddish-brown; internally pale, reddish-white. Its odour is agreeable aromatic; its taste peppery and aromatic. It is the rhizome of *Alpinia Galanga*, Rox. It has been analyzed by Bucholz (Trommsdorf's *Journal*, xxv. 2, p. 3,) and by Morin (*Journ. de Pharm.*) ix. p. 257.) The former obtained *Volatile Oil* 0·5, *Acrid soft Resin* 4·9, *Extractive* 9·7, *Gum* 8·2, *Bassorin* 41·5, *Woody fibre* 21·6, *Water* 12·3, Loss 1·3. Its effects, uses, and doses, are analogous to ginger.

The *Zed'oary root* (*radix zedoariæ*, offic.) of English druggists, appears to me to agree with Professor Guibourt's description of *round zedoary* (*zedoria rotunda*). It is the sliced tuber of *Curcuma Zedoaria*, Roxburgh. It occurs in segments (halves, quarters, or flat sections) of a roundish or ovate tuber. The external portion of the tuber is marked by the remains, membranes, and fibres, and is of a pale brownish gray or whitish appearance. When cut it presents a yellowish marble appearance, not very dissimilar to the cut surface of rhubarb. It has a warm, aromatic, bitter taste, and an aromatic odour. It has been analyzed by Bucholz (*Trommsdorf's Journal*, xxv. 2, p. 3) and by Morin (*Journ. de Pharm.* t. ix. p. 257). Its constituents, according to the latter chemist, are—*Volatile oil*, *Resin*, *Gum*, *Starch*, *Woody-fibre*, *Vegeto-animal Matter (?)*, *Osmazome (?)*, *free Acetic Acid*, *Acetate of potash*, *Sulphur*, and in the ashes, *Carbonate* and *Sulphate of potash*, *Chloride of potassium*, *Phosphate of Lime*, *Alumina*, *Silica*, *Oxides of Iron and Manganese*. It possesses aromatic and tonic properties. It is less heating than ginger and galangal, and is more analogous to turmeric.

Cassamuna'r root is considered by English druggists to be identical with *Zerumbet root* (*Private Information:* also Gray, *Pharmacology*). It appears to me to be the *Turmeric-coloured Zedoary* of Ainslie (*Mat. Indica*, vol. i. p. 490). Is it the produce of *Zingiber Cassamunar*, Roxburgh? It occurs in segments (halves or quarters) of an ovate tuber (which in the dried state must have been about the size of a pigeon's egg), the external surface of which is marked with circular rings and the bases of the root-fibres, and is of a dirty turmeric-yellow colour. Internally it is reddish-brown, and has some resemblance, in its colour and pellucidity, to a fresh fractured surface of Socotrine aloes. Its flavour is warm and aromatic; its odour is aromatic. It has not been analyzed. Its effects must be similar to those of ginger. It was at one time used in convulsive and other cerebral diseases (Sir Hans Sloane, *Phil. Trans.* vol. xxii. No. 264, p. 580).

The *Zerum'bet root*, which I have received from my friend Dr. Royle, is very similar in shape to a curved or arched piece of long turmeric. Its colour is yellowish-gray.

Besides the cardamoms already mentioned, there are several others which I have met with, and which, therefore, I notice to make the account of these fruits complete.

FIG. 132.

Ovoid China Cardamom.

1. *Ovoid China cardamom*, Guibourt. *Tsao quo*, Loureiro. Fig. 132.—This is the fruit of *Alpinia alba*, Roscoe (*Hellenia alba*, Willd. *Amomum medium*, Loureiro). Loureiro gave specimens of the fruit to the Muséum d'Histoire naturelle of Paris. For my specimens I am indebted to the kindness of Professor Guibourt.

The dried fruit is about the size and shape of a large nutmeg: it is ovoid, from ten to fourteen lines long, and from six to eight lines broad, rather rigid, striated longitudinally, yellowish-brown with a reddish tint [it is scarlet when recent: *König*]. Seeds numerous, very large, pyramidal, brown externally, flavour and odour terebinthinate; albumen white, embryo yellow.

2. *Round China cardamom*, Guibourt.—"The Muséum d'Histoire naturelle possesses two varieties of this fruit mixed together. The seeds, merely united in globular and coherent masses, are marked *Cao-Keu;* and the entire fruits *Tsao-Keou*" (Guib. *Hist. des Drog.* ii. 287, 3me ed.)

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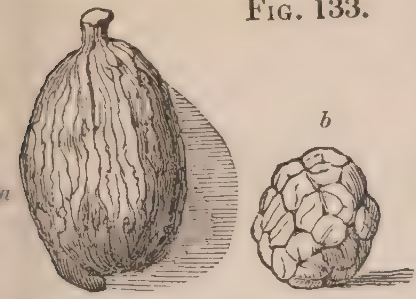
upper part of the rhizome, flexuose, jointed, nine inches long, branched; the branches alternate, one from each joint of the scape, suberect, half an inch long, supporting two or three pedicels of about 3-10ths of an inch. *Bracts* solitary, sheathing, at each joint of the scape, withered; partial ones, solitary, ovate, acute. *Flowers* not present. *Capsules* one or two on each branch of the scape, with the permanent calyx attached to them: their characters as described in the text.

α. *Large round China cardamom* (Guib. MS.) Fig. 133. — Probably the fruit of *Amomum globosum*, Loureiro. On comparing Professor Guibourt's specimen (of which Fig. 133 is a drawing) with the fruit of Alpinia nutans (*Wallich's Collect. at the Linn. Soc. House*), the two are scarcely distinguishable externally; the seeds, however, are dissimilar. *Capsule* thin, round, or oval. *Seeds* in globular masses, marked, on the surface opposed to the pericarp, by a linear depression or groove. I have observed specimens in the Sloanian Collection, as also in a collection of Chinese medicines at the College of Physicians.

Fig. 133.



Large round Cardamom.
a, Fruit.
b, Globular mass of seeds.

β. *Small round China cardamom* (Guib. MS.)—*Capsules*, ovate-oblong, obtusely triangular. *Seeds* have no linear depression or groove as those of the larger variety have; coherent in masses, which are three-lobed, not quite globular. In my specimens the epicarp is eroded.

3. *Black cardamom*, Gærtner.—*Capsule* larger than the short Malabar cardamoms, acuminate at its two extremities, and formed, as it were, of two obtusely-triangular pyramids joined base to base. *Pericarp* ash-brown, aromatic, but less so than the seeds (Guibourt). *Seeds* angular, brown.

4. In Dr. Burgess's collection at the College of Physicians is a capsule (in a bad state of preservation) marked "*Cardamomum majus*." Its size and shape are analogous to the grain of paradise pod (fig. 125). It has a fibrous tuft (remains of calyx?) at one extremity, and is much split at the other. The seeds are angular, oblong, larger than those of Malabar cardamoms, shining brownish yellow, and have a large concave depression (hilum) at one extremity. They have a warm aromatic flavour and an agreeable odour, somewhat analogous to that of the oil of lemon-grass.

The *Cos'tus arab'icus*, which I have found in the warehouse of a London druggist, is identical with that described by Professor Guibourt (*Hist. des Drog.*), and with that brought from India by Professor Royle.

ORDER 19. ORCHID'EÆ, *R. Brown*.—THE ORCHIS TRIBE.

ORCHIDES, *Jussieu*. ORCHIDACEÆ and VANILLACEÆ, *Lindley*.

This remarkable order of gynandrous monocotyledons is, in reference to its dietetical and medicinal properties, of little importance.

The tuberous or palmate roots abound in gummy and, at certain times, in farinaceous matters, which render them nutritive, emollient, and demulcent. *Salep* is the prepared and dried roots of several orchideous plants, and is sometimes sold in the state of powder. *Indigenous Salep* is procured from *Orchis mascula*, *O. latifolia*, and other native plants of this order (Dr. Percival, *On the Preparation, Culture, and Use of the Orchis Root*, 1773). *Oriental Salep* is procured from other Orchideæ. Professor Royle states that the salep of Cachmere is obtained from a species of *Eulophia*. The notions of the aphrodisiac properties of salep seems to be founded on the doctrine of signatures.

The *Vanilla* of the shops is the fruit of *Vanilla aromatica*, Sw., a native of Peru, Mexico, Jamaica, and Cuba. Schiede (Schlechtendal's *Linnæa*, Oct. 1829, S. 573) mentions three other Mexican species (*V. sativa*, *V. sylvestris*, and *V. Pompona*) which yield vanilla. Notwithstanding the strong odour of this fruit, no volatile oil can be obtained by distillation. (See Bucholz' analysis in Buckner's *Repert.* ii. 253). The white acicular crystals found on the fruit, are a kind of solid volatile oil. Vanilla is employed in this country for flavouring chocolate, ice-creams, &c. But on the continent it is used as a medicinal agent. It is an aromatic stimulant; has an exhilarating effect on the mental functions, prevents sleep, increases the energy of the muscular system, and excites the sexual feelings (Sundelin, *Heilmittellehre*, ii. 203, 3te Aufl.) It has been administered in asthenic fevers, rheumatism, hysteria, impotence of the male, melancholy, &c. The dose of it is from 8 to 12 grains (Vogt, *Pharmak.* ii. 600, 2 Aufl.)

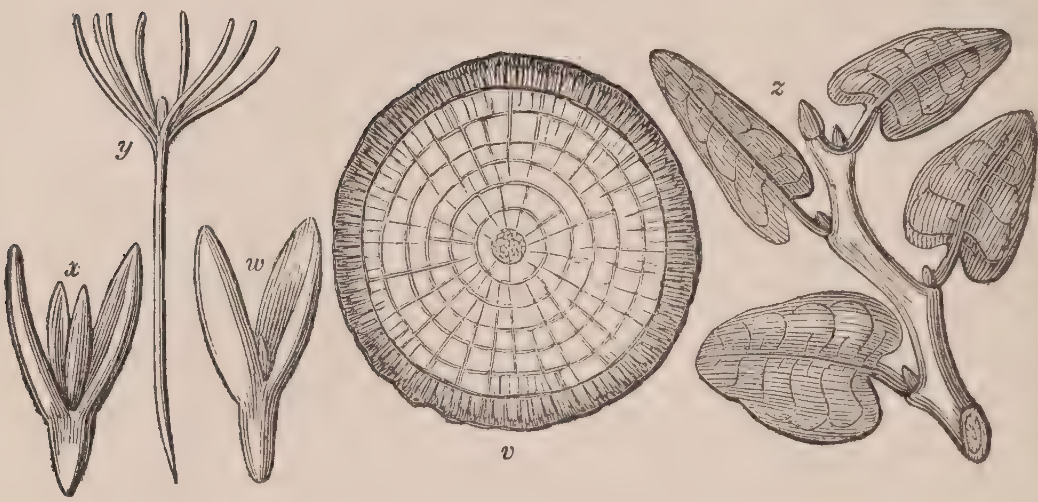
Fig. 134.

Vanilla aromatica.

3. EXOG'ENÆ, *Decand.*—EX'OGENS.

DICOTYLEDONES, *Jussieu.*

FIG. 135.



Exogens, or *Dicotyledons.*

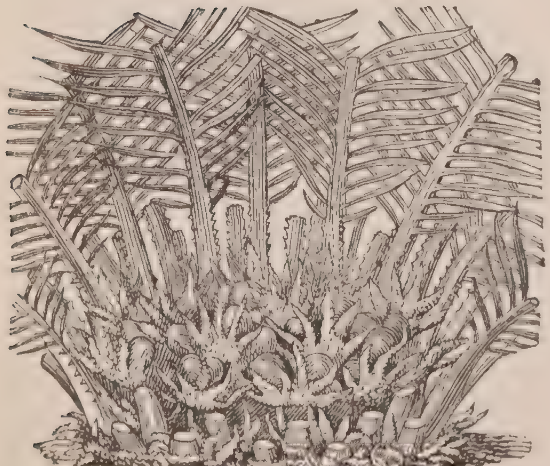
(*v*) Transverse section of a dicotyledonous stem, shewing medullary rays, and the distinction of bark, wood, and pith.
(*w*) Embryo with two cotyledons.
(*x*) Embryo with four cotyledons.
(*y*) Embryo with many cotyledons.
(*z*) Stem and leaves of a dicotyledon, shewing the articulation and the anastomosing veins of the leaves.

ESSENTIAL CHARACTERS.—*Trunk*, consisting of bark, wood, and pith, placed one within the other; the pith being innermost. *Bark*, composed of strata (the younger and inner being called *liber*), increasing by the deposit of new cortical matter on its inner side. *Wood*, consisting of ligneous strata, traversed by *medullary rays*, and increasing by the deposit of new woody matter on its outer side (*exogenous growth*): the older and inner strata are called *duramen*, or *perfect wood*; the younger and outer strata are termed *alburnum*, or *sap wood*. *Leaves* articulated with the stems; their veins branching and anastomosing (*angulinerved; reticulated*). *Flowers*, if with a distinct calyx, often having a quinary arrangement. *Embryo* with two more cotyledons (*dicotyledonous*): if two, they are opposite; if more than two, they are verticillate: radicle naked; *i. e.* elongating, without penetrating any external case (*exorrhizous*).

ORDER 20. CYCADA'CEÆ, *Lindley.*—THE CY'CAS TRIBE.

CYCADEÆ, *Richard* and *R. Brown.*

FIG. 136.



Cycas revoluta,
or, *the Japan Sago tree.*

I notice this order for the purpose of stating, that a feculent matter is obtained from the soft centre of some species of *Cycas* (as *C. circinalis*, *C. revoluta*, and *C. inermis*). This fecula (*Japan sago*) is quite unknown to me; and I doubt whether it ever reaches this country. (Consult on this subject Schenk's *Naturgeschichte der vorzüglichsten Handelspflanzen*, 4to. Bd. 2^er, S. 139, Taf. xlvi.)

ORDER 21. CONIF'ERÆ, *Jussieu.*—THE FIR TRIBE.

CONACEÆ or PINACEÆ, *Lind.*

ESSENTIAL CHARACTER.—*Flowers* monœcious or diœcious. *Males* monandrous or monadelphous; each floret consisting of a single *stamen*, or of a few united, collected in a deciduous amentum, about a common rachis; *anthers* two-lobed or many-lobed, bursting outwardly; often terminated by a crest, which is an unconverted portion of the scale out of which each stamen is formed; *pollen* large, usually compound. *Females* in cones. *Ovary* spread open, and having the appearance of a flat scale destitute of style or stigma, and arising from the axil of a membranous bract. *Ovule* naked; in pairs on the face of the ovary, having an inverted position, and consisting of one or two membranes, open at the apex, and of a nucleus. *Fruit* consisting of a cone formed of the scale-shaped ovaries, become enlarged and indurated, and occasionally of the bracts also, which are sometimes obliterated, and sometimes extend beyond the scales in the form of a lobed appendage. *Seed* with a hard crustaceous integument. *Embryo* in the midst of fleshy oily albumen, with two or many opposite *cotyledons;* the *radicle* next the apex of the seed, and having an organic connexion with the albumen. *Trees* or *shrubs*, with a branched trunk abounding in resin. *Wood*, with the ligneous tissue marked with circular disks. *Leaves* linear, acerose or lanceolate, entire at the margins; sometimes fascicled in consequence of the non-developement of the bracts to which they belong; when fascicled, the primordial leaf to which they are then axillary is membranous, and enwraps them like a sheath. (Lindley).

PROPERTIES.—Every part of coniferous plants contains an oleo-resinous juice, which yields by distillation a volatile oil, differing often in odour but agreeing in composition in each species. This juice is a local irritant, and acts as a powerful stimulant to the vascular system and the organs of secretion (especially the kidneys and the mucous membranes). Moreover, it appears to possess a specific influence over the nervous system: for oil of turpentine, in large doses, has operated as an inebriant and soporific; savin is said by Orfila (*Toxicol. Gén.*) to act on the nervous system; and the leaves of yew are narcotic.

Pi'nus, Decandolle.—*The Pine.*

Sex. Syst. Monœcia, Monadelphia.

BOTANY. *GEN. CHAR.*—*Flowers* monœcious. *Males—catkins* racemose, compact, and terminal; squamose; the *scales* staminiferous at the apex. *Stamens* two; the *anthers* one-celled. *Females—catkins* or *cones* simple, imbricated with acuminate scales. *Ovaries* two. *Stigmas* glandular. Scales of the *cone* oblong, club-shaped, woody; umbilicato-angular at the apex. *Seeds* [nuts, *Dec.*] in pairs, covered with a sharp-pointed membrane. *Cotyledons* digitato-partite. *Leaves* two or many, in the same sheath (Decandolle and Dubuy, *Bot. Gall.*) Hardy, evergreen trees.

SPECIES. 1. *Pi'nus sylves'tris*, Linn. L. D.; *Wild Pine* or *Scotch Fir.*—*Leaves* in pairs, rigid. *Cones* ovato-conical, acute; young ones stalked, recurved, as long as the leaves; generally in pairs. Crest of the *anthers* very small. *Embryo* five-lobed. (*Bot. Gall.*) Highlands of Scotland, Denmark, Norway, and other northern countries of Europe. Flowers in May and June. A tall, straight, hard, long-lived tree, determinately branched. Its *wood* is the red or yellow deal. It yields *common turpentine, tar*, and *pitch.*

2. *Pi'nus Pinas'ter*, Aiton, Lambert; *P. maritima*, Decand; *The Pinaster* or *Cluster Pine.*—*Leaves* twin, very long, rigid, pungent, furnished at the base with a reflexed scale. *Cones* oblong-conical, obtuse, very smooth, bright, shorter than the leaves. *Scales* bristly. (*Bot. Gall.*)

Southern maritime parts of Europe. Very abundant in the neighbourhood of Bordeaux, and between this city and Bayonne. It is a much

Fig. 137.

Fig. 138.

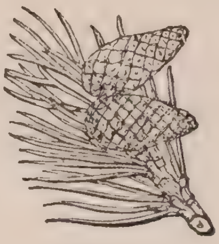


Fig. 139.

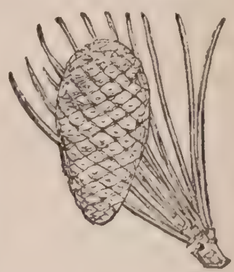


Fig. 140.

Fig. 137. *Pinus sylvestris.*
Fig. 138. Branch and cones of ditto.
Fig. 139. Branch and cones of *Pinus Pinaster.*

Fig. 140. Flowering branch and cone of *Pinus Pinea*

larger tree than the Scotch fir. Flowers in May. It yields *Bordeaux turpentine*, *galipot*, *tar*, and *pitch*.

3. *Pi'nus palus'tris*, Lambert; *the Swamp Pine.—Leaves* three, very long. *Cones* subcylindrical, armed with sharp prickles. *Stipules* pinnatifid, ragged, persistent (Lambert.) A very large *tree*, growing in dry sandy soils, from the southern parts of Virginia to the Gulf of Mexico. "Its mean elevation is 60 or 70 feet, and the diameter of its trunk about 15 or 18 inches for two-thirds of this height. The *leaves* are about a foot in length, of a brilliant green colour, and united in bunches at the ends of the branches. The names by which the tree is known in the Southern States are *long-leaved pine*, *yellow pine*, and *pitch pine*; but the first is the most appropriate, as the last two are applied also to other species. This tree furnishes by far the greater proportion of *turpentine, tar*, &c. consumed in the United States, or sent from this to other countries" (*United States Dispensatory*).

4. *Pi'nus Tæda*, Lambert; *the Frankincense Pine.*—Abundant in Virginia. Yields *common turpentine*, but of a less fluid quality than that which flows from the preceding species.

5. *Pi'nus Pi'nea*, Lambert, Decandolle; *the Stone Pine.*—Grows in the south of Europe and northern part of Africa. Yields the cones called, in the shops, *pignoli pines*, the seeds of which, termed *pine nuts*, (πιτυίδες, Diosc.; *pityida*, Pliny; *nuclei pineæ, pineoli*) are used as a dessert.

6. *Pi'nus Pumil'io*, Lambert; *the Mugho* or *Mountain Pine.*—A native of the mountains of the south of Europe. An oleo-resin, called *Hungarian balsam* (*balsamum hungaricum*), exudes spontaneously from the

extremities of the branches and from other parts of the tree. By distillation of the young branches with water, there is obtained in Hungary an essential oil, called *Krummholzöl*, or *Oleum templinum.*

7. *Pi'nus Cem'bra*, Lambert; Decandolle; *the Siberian Stone Pine.*—The seeds, like those of Pinus Pinea, are eaten. By distillation the young shoots yield *Carpathian balsam* (*balsamum carpathicum; b. Libani*).

A'bies, Decandolle.—*The Fir.*

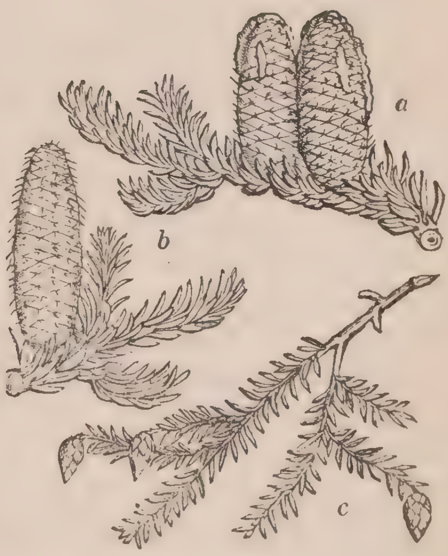
Sex. Syst. Monœcia, Monadelphia.

Botany. *Gen. Char.*—*Flowers* monœcious. *Males—catkins* solitary, not racemose; the *scales* staminiferous at the apex. *Stamens* two; the *anthers* one-celled. *Females—catkins* simple. *Ovaries* two. *Stigmas* glandular. Scales of the *cone* imbricated; thin at the apex, rounded, (neither thickened, angular, nor umbilicated on the back). *Cotyledons digitato-partite. Leaves* solitary in each sheath (*Bot. Gall.*)

Fig. 141.

Abies excelsa.

Fig. 142.



a, Abies Picéa.
b, Abies Balsamea.
c, Abies Canadensis.

Species.—1. *A'bies excel'sa*, Dec. E; *Pinus Abies*, Linn. L. D.; *the Norway Spruce Fir.*—*Leaves* tetragonal. *Cones* cylindrical; the scales rhomboid, flattened, jagged, and bent backwards at the margin. (*Bot. Gall.*) A native of Germany, Russia, Norway, and other parts of Europe; also of the northern parts of Asia. Commonly cultivated in England. Flowers in May and June. A very lofty tree, growing sometimes to the height of 150 feet. It yields, by spontaneous exudation, *common frankincense*, or *Thus* (*Abietis resina*, L.), from which is prepared *Burgundy pitch* (*Pix Abietina*, L.)

2. *A'bies balsa'mea*, Lindley, E.; *Pinus balsa'mea*, Linn. Lambert, L. D.; *the Canada Balsam Fir: Balm of Gilead Fir.*—*Leaves* solitary, flat, emarginate, subpectinate, suberect above. Scales of the flowering *cone* acuminate, reflexed. An elegant *tree*, seldom rising more than 40 feet. Inhabits Canada, Nova Scotia, Maine, Virginia, and Carolina. Yields *Canada balsam.*

3. *A'bies canaden'sis*, Lindley, in Loudon's *Encycl. of Plants; Pinus canadensis*, Linn. Lambert; *the Hemlock Spruce Fir.*—Said to yield an oleo-resin analogous to Canada balsam.

4. *A'bies Pi'cea*, Lindley; *Abies pectinata*, Decandolle; *Pi'nus Pi'cea*, Linnæus; *the Silver Fir.*—Mountains of Siberia, Germany, and Switzerland. Yields *Strasburgh turpentine.*

5. *A'bies ni'gra*, Michaux; *Pi'nus nigra*, Lambert; *the Black Spruce Fir.*—The concentrated aqueous decoction of the young branches, is *essence of spruce*, used in the preparation of *spruce beer* (*United States Dispensatory.*)

La'rix europœa, Decandolle.—The *Common Larch.*

Abies Larix. Lam. E. Pinus Larix, Linn. D.

Sex. Syst. Monœcia, Monadelphia.

Botany. *Gen. Char.*—*Flowers* monœcious. *Character* as in Abies; but the *Cotyledons* are simple and never lobed. *Cones* lateral. *Leaves*, when first expanding, in tufted fascicles, becoming somewhat solitary by the elongation of the new branch (*Bot. Gall.*)

Sp. Char.—*Leaves* fascicled, deciduous. *Cones* ovate-oblong. Edges of *scales* reflexed, lacerated. *Bracts* panduriform (Lambert.)

Hab.—Alps of Italy, Switzerland, Germany, Siberia, &c. Cultivated in woods.

Products.—This species yields *Larch* or *Venice turpentine.* When the larch forests of Russia take fire, a gum issues forth from the medullary part of the trunks, during combustion, which is called *Orenburgh gum* (*Gummi orenburgense*). A saccharine matter exudes from the larch, about June, which is called *Manna of the Larch*, or *Manna de Briançon.* Lastly, a fungus, called *Polyporus Laricis* (vide p. 574), is nourished on this tree.

Medicinal Substances obtained from the preceding Coniferous Plants.

The term *turpentine* (*terebinthina*) is ordinarily applied to a liquid or soft solid oleo-resinous juice of certain coniferous plants, as well as of the *Pistachia Terebinthus*, a plant of the order *Terebintaceæ*, Juss. Indeed this last-mentioned plant, *Pistachia Terebinthus*, is probably the true *Terebinthus* of the ancients (Τερμίνθος, Theoph. and Dioscorides). When submitted to distillation, these juices are resolved into a *volatile oil* (*oleum terebinthinæ*) and a *resinous residuum.* The roots and other hard parts of coniferous trees yield, by a kind of *distillatio per descensum*, the thick liquid called *tar*, from which *pitch* is procured. Hence it will be convenient to speak of the coniferous terebinthinates under four heads:—1st, the *oleo-resinous juices*; 2dly, the *volatile oil* obtained therefrom by distillation; 3dly, the *resinous residuum*; 4thly, *tar* and *pitch.*

I. *Oleo-Resinæ Terebinthinæ.—Terebinthinate Oleo-Resins.*

Preparation; Properties; and Composition.—At first these oleo-resins are liquid, but by age and exposure to the air they become, more or less speedily in the different varieties, solid, partly by the volatilization, partly by the resinification of the volatile oil. They have a certain general similarity in taste and odour. They soften and become very fluid by heat, readily take fire in the air, and burn with a white flame, and, if the supply of air be limited, with the copious deposition of finely-divided carbon (*lamp black*). They are almost completely soluble in alcohol and ether; and yield by distillation a volatile oil, which passes over usually with a small quantity of succinic acid and a resinous residuum. Water acquires a terebinthate flavour when digested with them; and by the aid of the yolk or the white of an egg, or still better by that of vegetable mucilage, forms an emulsion with them.

1. *Common Turpentine* (*Terebinthina vulgaris*, L. D.)—Under this name we find oleo-resins brought from various parts of the world, obtained from different species of *Pinus*, and, though agreeing in the main in their properties, possessing certain distinctive characters. At the present time the London market is almost exclusively supplied from New York, a small quantity only being imported from Bordeaux. In the years 1830 and 1831 the quantities of turpentine (not of greater value than 12*s*. per cwt.) which were imported from the United States and France, were as follows:—

	1830.			1831.		
	cwts.	*qrs.*	*lbs.*	*cwts.*	*qrs.*	*lbs.*
From France	43	1	12	799	3	19
United States of America	234,747	0	12	317,095	1	7
Total........	234,790	1	24	317,895	0	26

(*a.*) *American* or *White Turpentine* (the *Térébenthine de Boston* of the French) "is procured chiefly from the *Pinus palustris*, partly also from the *Pinus Tæda*, and perhaps some other species inhabiting the Southern States. In former times, large quantities were collected in New England; but the turpentine trees of that section of the Union are said to be nearly exhausted; and our commerce is almost exclusively supplied from North Carolina and the south-eastern parts of Virginia" (*United States Dispensatory*).

The method of procuring this turpentine is as follows:—A hollow is cut in the tree, a few inches from the ground, and the bark removed for the space of about 18 inches above it. The turpentine runs into this excavation from about March to October, more rapidly of course during the warmer months. It is transferred from these hollows into casks (Michaux, *N. Am. Sylv.* iii.; Way, *Trans. of the Soc. of Arts*, vol. xxviii. p. 89; Duhamel, *Traité des Arbres*, t. ii. p. 14, Paris, 1755). It is imported from New York in casks; those from North Carolina holding 2 cwts., while those from South Carolina contain 2½ cwts. It is yellowish-white, with an aromatic odour, and a warm, pungent, bitterish taste. It is translucent or opaque. Its consistence varies, being semifluid, or, in cold weather, that of a soft solid. It contains various impurities (leaves, twigs, chips, &c.) That got from the first tappings is the best, and is called *Virgin Turpentine*. Recent American turpentine is said (*United States Dispensatory*) to yield 17 per cent. of essential oil.

(*b*.) *Bordeaux Turpentine* is obtained by making incisions in the *Pinus Pinaster*, Lambert, (*P. maritima*, Decand.) and collecting the turpentine in hollows at the foot of the tree. Every month these hollows are emptied, and the oleo-resin conveyed in pails to a reservoir. In this state it is called *soft gum* (*gomme molle*). It is purified either by heating it in large boilers, and filtering through straw, (*térébenthine galipot*); or by exposing it in a barrel, the bottom of which is perforated by holes, to the sun; the liquid which drains through is called *térébenthine au soleil.* The last method yields the best product, since less volatile oil is dissipated by it. (Guibourt, *Hist. des Drog.* t. ii. p. 578; Duhamel, *Traité des Arbres*, t. ii. p. 147). The turpentine which flows during the winter is called *galipot* in Provence, *barras* in Guienne. It is in the form of semi-opaque, solid, dry crusts of a yellowish-white colour, a terebinthinate odour, and a bitter taste (Guibourt, *op. cit.*)

Bordeaux turpentine is whitish, thickish, and turbid. It has a disagreeable odour, and an acrid, bitter, nauseous taste. On standing it separates into two parts: one thinner, yellow, and almost transparent; another thicker, whitish, and of the consistence of thick honey, having a granular consistence. Bordeaux turpentine readily becomes hard and dry by exposure to the air. It enjoys, with balsam of copaiva, the property of solidifying with magnesia, and in this respect is distinguished from Strasburgh turpentine.

Common turpentine has been analyzed by MM. Moringlane, Duponchel, and Bonastre, (*Journ. de Pharm.* t. viii. p. 329), and by Unverdorben (Berzelius, *Traité de Chim.* and Gmelin, *Hand. d. Chem.*) The last-mentioned chemist found it to consist of *two Volatile Oils* (*oil of turpentine*), *Pinic acid*, a little *Sylvic acid*, a trace of an *Indifferent Resin* not soluble in oil of petroleum, and a small quantity of *Bitter Extractive.* The quantity of volatile oil varies from 5 to 25 per cent. of the weight of the turpentine.

2. *Larch* or *Venice Turpentine* (*Terebinthina veneta*, E. D. *Terebinthina laricea*).—Obtained from *Larix europæa*, Dec. by boring the trunks of the trees, and adapting to each hole a wooden gutter, which conveys the juice into a tub or trough, from which it is afterwards withdrawn for filtration (Duhamel, *Traité des Arbres*, tom. i. p. 335).

Through the kindness of Professor Guibourt I have received an authentic sample of larch turpentine. It was collected in the wood of the Bishop of Maurienne in Savoy, by order of the bishop, and at the urgent solicitation of M. Bonjean, Pharmacien, naturalist of Chambery. The same kind of turpentine, collected in Switzerland (*Swiss turpentine*, Guib. MSS.) is sold in Paris as *Strasburgh turpentine* (*Térébenthe de Strasbourg*, Guib. *Hist. des Drog.* t. ii. p. 577, 3^{me} ed.), and was formerly called *Venice turpentine.* It is a thick and consistent fluid, flowing with difficulty, is sometimes transparent, but more frequently cloudy, has a yellow or greenish-yellow tint, an odour which is peculiar, not very agreeable, weaker than that of either Strasburgh or common turpentine, but less disagreeable than the latter, and an acrid, very bitter taste. It has little or no tendency to concrete by keeping—a property known to Pliny (*Hist. Nat.* lib. xvi. cap. 19, ed. Valp.), and which distinguishes it from common turpentine.

A factitious substance (*Terebinthina veneta factitia*) is sold by London druggists for Venice turpentine. It is prepared by mixing f℥v. of oil of turpentine with lb. j. of black rosin. A similar preparation is found in the shops of the United States of America, (*United States Dispensatory*) and is probably identical with that imported from America under the name of Venice turpentine (Dr. Maton, in Lambert's *Descrip. of the genus Pinus*; and Dr. A. T. Thomson, *London Dispensatory*).

Berzelius and Unverdorben (Berzelius, *Traité de Chim.* t. v. p. 477, and Gmelin, *Handb. d. Chem.*) have submitted Venice turpentine to examination, and with the following results:—

Berzelius's Analysis.	*Unverdorben's Analysis.*
1. Oil of turpentine, probably composed of two oils.	1. Volatile oil, which readily distils.
2. Resin insoluble in cold oil of petroleum.	2. Volatile oil, which distils less readily, and has a tendency to resinify.
3. Resin soluble in cold oil of petroleum.	3. Succinic acid (small quantity).
	4. Much Pinic acid.
	5. A little Sylvic acid.
	6. Indifferent resin, insoluble in oil of petroleum.
	7. Bitter Extractive.
Old Venice Turpentine.	Fresh Venice Turpentine.

Larch resin yields from 18 to 25 per cent. of volatile oil (Berzelius, *op. cit.*)

3. *Strasburgh Turpentine* (*Terebinthina argentoratensis; Térébenthine au citron, ou Térébenthine d'Alsace*, Guib.)—This is obtained from *Abies Picea.* The peasantry, in the vicinity of the Alps, collect it by puncturing the vesicles adhering to the bark with sharp-pointed hooks, and receiving the juice in a bottle. It is afterwards filtered through a rude kind of bark funnel (Duhamel, *Traité des Arbres*, t. i. p. 9.)

Strasburgh turpentine is very fluid, transparent, of a yellowish colour, has a very agreeable odour of citron, and a taste moderately acrid and bitter. It consists, according to Caillot (*Journ. de Pharm.* xvi. p. 436), of *Volatile Oil* 33·5, *Resin* insoluble in alcohol 6·20, *Abietin* (a crystallizable resin) 10·85, *Abietic acid* (? Pinic and Sylvic acids) 46·39, *Extractive* and *Succinic acid* 0·85, *Loss* (principally volatile oil) 2·21.

4. *Canadian Turpentine* or *Canada Balsam* (*Terebinthina canadensis*, L. *Balsamum canadense*, E. D.) is obtained from *Abies balsamea* in Canada and the state of Maine. Between the bark and the wood of the trunks and branches of these trees are vesicles containing this oleo-resin, which exudes when they are broken, and is received in a bottle. It is imported in casks containing each about one cwt. In 1838 the quantity imported was 7259 lbs. (*Trade List* for 8th Jan. 1839). When fresh it has the consistence of thin honey, but by age gradually solidifies; it is yellow, transparent, very tenacious, of a peculiar and agreeable terebinthinate odour, and of a slightly bitter, somewhat acrid, taste.

Canada balsam has been analyzed by Bonastre (*Journ. de Pharm.* viii. 337), who obtained the following results:—*Volatile oil* 18·6, *Resin easily soluble in alcohol* 40·0, *Sub-resin difficultly soluble* 33·4, *Fibrous Caoutchouc, like Sub-resin* 4·0, *Acetic acid* traces, *Bitter Extractive, and Salts* 4·0.

5. *Common Frankincense* (*Abietis resina*, L. *Thus.* D.) This is the spontaneous exudation of *Abies communis.* It concretes in distinct drops, or tears, which are compact, opaque, of a deep yellow colour. What is found in the shops of London is a soft solid, having considerable re-

semblance to the dried opaque portion of common turpentine. The turpentine (? Thus) of the *Abies communis* has been analyzed by Caillot, (*Journ. de Pharm.* t. xvi. p. 436) who obtained the following results:—*Volatile Oil* 32·00, *Resin* insoluble in alcohol 7·40, *Abietin* (a crystallizable resin) 11·47, *Abietic acid* (? Pinic and Sylvic acids) 45·37, *Extractive* and *Succinic acid* 1·22, *Loss* (principally volatile oil) 2·52.

Physiological Effects.—The effects of terebinthinate substances have been before noticed (p. 73). Locally they operate as irritants. Applied to the skin they cause rubefaction, and sometimes a vesicular eruption. Swallowed they give rise to a sensation of warmth at the stomach, in large doses occasion sickness, and promote the peristaltic movement of the intestines. After their absorption they operate on the general system as stimulants, and excite the vascular system, especially of the abdominal and pelvic viscera. Their influence is principally directed to the secreting organs, more especially to the mucous membranes and the urinary apparatus. They act as diuretics, and communicate a violet odour to the urine. This odour depends on a portion of the oil having undergone a slight change in its nature during its passage through the system. Part of the oil, however, is thrown off unchanged; for Moiroud (*Pharmacol.-Veterin.* p. 312) has observed, that at the same time that the turpentines cause a violet odour, they flow in part with the urine. "I have verified," says he, "this double phenomenon on many horses, to whom turpentine has been given, for some days, in the enormous dose of ten or twelve ounces." But the kidneys are not the only parts engaged in getting rid of the absorbed turpentine. All the secreting organs, but more especially the bronchial surfaces and the skin, are occupied in the same way. By these the oil is exhaled apparently unchanged, or at least with its usual odour. During the circulation of the terebinthinate particles in the system, they exercise a local influence over the capillaries and secerning vessels, in the vital activity of which they effect a change. In certain morbid conditions, this change is of a most salutary nature. In catarrhal affections of the mucous membranes the secerning vessels become constringed under the use of terebinthinates, and the discharge is, in consequence, checked.

The most important, because by far the most active, constituent of the terebinthinate oleo-resins is volatile oil. Hence their effects are almost identical with the latter (vide *Oleum Terebinthinæ*, p. 710). Some slight differences, however, are to be noticed. They are less rapidly absorbed, are more permanent in their operation, confine their influence principally to the apparatus of organic life, not affecting, at least to the same extent, the brain, and act less powerfully on the cutaneous system.

We have few data on which to rely in judging of the comparative influence of the different terebinthinates; but as their most active constituent is volatile oil, we may fairly infer that those which possess the greatest liquidity, and which, in consequence, contain the largest quantity of oil, are the most powerful preparations. *Venice* and *Strasburgh Turpentines* stand in this respect pre-eminent. *Canada Balsam* is valuable on account of its purity and agreeable flavour. In activity, purity, and flavour, *Common Turpentine* holds the lowest rank.

Uses.—The terebinthinate oleo-resins are, with some exceptions, applicable for the same purposes as the volatile oil. The following are the principal cases in which they are employed:—

1. *In mucous discharges from the urino-genital organs;* as gonorrhœa, gleet, leucorrhœa, and chronic cystorrhœa.

2. *In chronic catarrh, both mucous and pituitous,* occurring in old persons of a lax fibre and lymphatic temperament.

3. *In chronic mucous diarrhœa, especially when accompanied with ulceration of the mucous follicles.*

4. *In colic and other cases of obstinate constipation,* Cullen (*Treat. of the Mat. Med.*) found a turpentine emulsion used as a clyster "one of the most certain laxatives."

5. *In chronic rheumatism,* especially sciatica and lumbago, the turpentines are occasionally used.

6. *As detergents and digestives* they have been sometimes applied to indolent and ill-conditioned ulcers.

Administration.—The dose of the terebinthinate oleo-resin is from a scruple to a drachm. They are given in the form of *pill, emulsion,* or *electuary.* To give the softer kinds a consistence fit for making pills, liquorice powder may be added to them. Bordeaux turpentine, mixed with about one-twenty-eighth part of its weight of calcined magnesia, solidifies in about twelve hours: the acid resins of this turpentine combine with the magnesia, and form solid resinates, which absorb the volatile oil. A turpentine emulsion is made with the yolk of egg, or mucilage of gum Arabic, sugar, and some aromatic water. To form an electuary they are mixed with sugar or honey. An emulsion, containing from half an ounce to an ounce of turpentine, may be used as a clyster, in obstinate constipation, ascarides, &c.

The terebinthinate oleo-resins yield several officinal substances, and enter into several preparations:—

1. Terebinthina vulgaris, L. D. yields *Oleum Terebinthinæ,* L. E. D. and *Resina,* L. E. D.; and enters into the composition of *Emplastrum Galbani,* L. and *Unguentum Elemi,* L.
2. Terebinthina veneta, E. D. is a constituent of *Emplastrum Cantharidis compositum,* E. and *Unguentum Infusi Cantharidis,* E.
3. Abietis Resina, L., Thus, D. yields *Pix Abietina,* L. (*Pix Burgundica,* E. D.): and enters into the composition of *Emplastrum Galbani,* L., *Emplastrum Opii.* L., *Emplastrum Picis,* L., *Emplastrum Aromaticum,* D., and *Emplastrum Thuris,* D. [already described at p. 540.]

II. *Oleum Terebinthinæ,* L. E. D.—*Oil of Turpentine.*

This essential oil is frequently, though erroneously, called *Spirits of Turpentine.*

Preparation.—It is obtained by submitting to distillation a mixture of American turpentine (which has been melted and strained) and water in due proportions, in the ordinary copper still, with a naked fire. The distilled product is found to consist of oil of turpentine swimming on water; the residue in the still is resin. If no water be employed a much higher temperature is required to effect the distillation, and danger is thereby incurred of causing empyreuma. Mr. Flockton, a large distiller of turpentine in this metropolis, informs me the average quantity of oil yielded by American turpentine is from 14 to 16 per cent. He also tells me that Bordeaux turpentine yields an oil having a more disagreeable odour, and a rosin of inferior quality.

To deprive it of all traces of resinous and acid matters, oil of turpentine should be re-distilled from a solution of caustic potash, and this is actually done, as Mr. Flockton informs me. The British Colleges, however, direct it to be purified by distillation with water only. In the *London* and *Edinburgh* Pharmacopœias, four times—in the *Dublin* only twice—its volume of water are ordered to be employed. *Purified*, or, as it is termed, *rectified oil of turpentine* (*oleum terebinthinæ purificatum*, L. E., *oleum terebinthinæ rectificatum*, D.) is employed for burning in flat-wicked lamps, under the name of *lamp naphtha.*

PROPERTIES.—Pure oil of turpentine is a colourless, limpid, very inflammable fluid. It has a peculiar, and, to most persons, disagreeable odour, and a hot taste. Its sp. gr. is 0·86 at about 70° F. It boils at about 314° F.; the density of its vapour is 4·76 (Dumas). When cooled down to 1° 4 F. it deposits crystals (*stéaroptène?*). It is very slightly soluble in hydrated alcohol. Exposed to the air, it absorbs oxygen, becomes yellowish, and somewhat denser, owing to the formation of resin (*pinic and sylvic acids*). Crystals (*hexahydrate of oil of turpentine*) sometimes form in old hydrous oil of turpentine. By submitting to distillation a mixture of water and old oil, an aqueous liquid is obtained, which yields more or less of the same crystals.

Oil of turpentine is composed of

	Eq.	*Eq. wts.*	*Per cent.*
Carbon	10	60	88·23
Hydrogen	8	8	11·76
Oil of Turpentine	1	68	99·99

It yields two or more distinct, but probably isomeric oils. One of these (*dadyl*, Blanchet and Sell) forms with hydrochloric acid a crystalline compound (*artificial camphor; hydrochlorate of oil of turpentine*); another (*peucyl*, Blanchet and Sell) forms with the same acid a liquid compound. But as the boiling points of the two oils, called by Blanchet and Sell, *dadyl* and *peucyl*, are higher than the boiling point of the oil of turpentine, these substances ought rather to be regarded as products than educts.

PHYSIOLOGICAL EFFECTS. (*a.*) *On vegetables.*—Plants exposed to the vapour of this oil are rapidly destroyed (Decandolle, *Phys. Vég.* p. 1347).

(*b.*) *On animals.*—On both vertebrated and invertebrated animals it operates as a poison. Injected into the veins of horses and dogs it excites pneumonia (Hertwich, and Gaspard; quoted by Wibmer, *Wirk. d. Arzn. u. Gifte.* Bd. iv. p. 212). Two drachms thrown into the veins of a horse, caused trembling, reeling, falling, inclination to pass urine and stools, and frequent micturition. Inflammatory fever, with cough, continued to the 8th day; then putrid fever appeared. On the 9th day death took place. The body presented all the signs of putrid fever and pneumonia (Hertwich). Schubarth (Wibmer, *op. cit.*) found that two drachms of the rectified oil, given to a dog, caused tetanus, failure of the pulse and breathing, and death in three minutes. The skin of the horse is very sensible to the influence of oil of turpentine, which produces acute pain. "It is a remarkable circumstance," says Moiroud (*Pharm. Vétér.* p. 314), "that this pain is not ordinarily accompanied with any considerable hyperæmia. It is quickly produced, but is of short duration." Oil of turpentine is sometimes employed by veterinarians as a blister, but it is inferior to cantharides, and, if frequently applied, is apt to blemish (*i. e.* to cause the hair of the part to fall off). In doses of three ounces it is a most valuable antispasmodic in the colic of horses (Youatt, *The Horse*, in *Lib. of Useful Knowledge*). In small doses it acts as a diuretic. Tiedemann and Gmelin (*Versuch ü. d. Wege auf welch. subst. ins Blut gelang.*) detected oil of turpentine in the chyle of a dog and a horse, to whom this agent had been given.

(*c.*) *On man.*—In *small doses* (as six or eight drops to fʒj.) it creates a sensation of warmth in the stomach and bowels, becomes absorbed, circulates with the blood, and in this way affects the capillary vessels, and is thrown out of the system by the different excretories, on the secerning vessels of which it acts in its passage through them. The exhalations of the skin and bronchial membranes acquire a marked terebinthinate odour, while the urine obtains the smell of violets. By its influence on the renal vessels it proves diuretic. By the same kind of local influence on the cutaneous vessels it proves sudorific. It appears to have a constringing effect on the capillary vessels of the mucous membranes, for, under its use, catarrhal affections of, and hæmorrhages from, these parts are frequently checked, and often are completely stopped. Its continued use sometimes brings on irritation of the urinary organs, or, when this state pre-existed, it is often aggravated by the use of turpentine.

In *a medium dose* (fʒj. or fʒij.) its effects are not constant. Dr. Ed. Percival (*Ed. Med. and Surg. Journ.* vol. ix.) saw two drachms given without any unpleasant effect being produced either on the digestive or urinary organs; they acted as an agreeable stomachic, and promoted the catamenia. Mr. Stedman (*Edinb. Med. Essays*, vol. ii. p. 42) on the other hand, has seen this dose produce strangury, bloody urine, suppression of this secretion, fever, thirst, and vomiting. These two cases, however, may be regarded as the opposite extremes; and, in general, we may expect, from a medium dose, a feeling of heat in the stomach and bowels, accelerated peristaltic motion, increased frequency of pulse, diaphoresis, diuresis, and sometimes irritation of the urinary organs. Occasionally it provokes the catamenia.

In *a large* or *maximum dose* (fʒiv. to f℥ij.) its effects are not constant. It usually causes a sensation of abdominal heat, sometimes nauseates, and in general operates as a tolerably active purgative, without causing any unpleasant effects. I have given from one to two fluid ounces in a considerable number of cases of tape-worm, and never saw any ill consequences therefrom. "It has been given," says Dr. Duncan, (*Edinb. Dispens.*) even to the extent of four ounces in one dose, without any perceptible bad effects, and scarcely more inconvenience than would follow from an equal quantity of gin." Cases are reported, however, in which it has failed to produce purging, and in such it has acted most violently on the system, accelerating the pulse, depressing the muscular power, and giving rise to a disordered state of the intellectual functions, which several persons have compared to intoxication. A remarkable and well-detailed instance of this occurred in the person of Dr. Copland, (*Lond. Med. and Phys. Journ.* vol. 46, p. 107), who refers the disorder of the cerebral functions, in his case, to diminished circulation of blood in the brain; while the gastric heat, &c. he ascribes to increased vascular activity in the abdominal region. The oil passed off most rapidly by the skin and lungs (principally by the latter), and the air of the apartment became strongly impregnated with its effluvia. In some cases it has caused sleepiness. Purkinje (quoted by Wibmer, *Wirk. d. Arzn.*) experienced this effect from one drachm of the oil. Dr. Duncan has sometimes seen it produce "a kind of trance, lasting twenty-four hours, without, however, any subsequent bad effect." The same writer adds, the "largest dose I have known given has been three ounces, and without injury." A scarlet eruption is mentioned by Wibmer as being produced in one case by an ounce of the oil.

Uses.—The following are the principal uses of oil of turpentine :—

1. *As an anthelmintic.*—It is the most effectual remedy for *tape-worm* we possess. It both causes the death of, and expels the parasite from the body. To adults it should be given in doses of an ounce at least. I have frequently administered an ounce and a half, and sometimes two ounces. In no instance have I ever seen any ill effects arise from its use. Yet occasionally, as in Dr. Copland's case, it fails to purge, but becoming absorbed, operates most severely on the system, causing disorder of the cerebral functions. It is said to be more apt to act thus in persons of a full and plethoric habit. To prevent these ill consequences an oleaginous purgative should be either conjoined with it, or given at an interval of four or five hours after it. An excellent and safe method of employing it is to combine it with a castor-oil emulsion. *Chabert's empyreumatic oil* (described at p. 235) used by Bremser (*Traité sur les Vers Intest.* p. 488) against tape-worm, consists principally of oil of turpentine. A very effectual remedy for the *small thread-worm* (*Ascaris vermicularis*) is the turpentine enema.

2. *In Blennorrhœa.*—Oil of turpentine sometimes checks or stops profuse chronic discharges from the mucous membranes. It appears to effect this by a topical influence over the capillary and secerning vessels, in its passage through them out of the system. In many cases it would appear to confine its operation to the production of an increase of tonicity in the vessels which pour out mucus; but in other instances, especially in blennorrhœa of the urinary apparatus, it seems to set up a new kind of irritation in the affected membrane, which supersedes the previously existing disease. Hence its use is not admissible in acute or recent affections of these tissues. In gonorrhœa and gleet I have frequently employed it as a substitute for balsam of copaiva with success. In leucorrhœa it has occasionally proved serviceable. In catarrhus vesicæ or cystirrhœa it now and then acts beneficially, but it requires to be used in small doses and with great caution. In chronic pulmonary catarrh, either mucous or pituitous, it is said to have been employed with advantage. In chronic diarrhœa and dysentery it has proved advantageous: in these cases it has a direct local action on the affected part, besides exerting its influence over this in common with other mucous membranes after its absorption.

3. *In Hæmorrhages.*—In sanguineous exhalations, called hæmorrhages, from the mucous surfaces, oil of turpentine may, under some circumstances, act efficaciously. On the same principle that it checks excessive secretion of mucus in catarrhal conditions of these tissues, so we can readily conceive it may stop the exhalation of blood. But it is only admissible in cases of a passive or atonic character, in the absence of plethora and a phlogistic diathesis (Adair, *Med. Facts and Observ.* vol. iv. p. 25; Copland, *Lond. Med. and Phys. Journ.* vol. xlvi. p. 194). In purpura hæmorrhagica it has been recommended as a purgative, by Dr. Whitlock Nichol (*Ed. Med. and Surg. Journ.* vol. xviii. p. 540)

Dr. Magee (ditto, vol. xxiv. p. 307), and others. I have seen it act injuriously in this disease, while blood-letting has seemed to relieve.

4. *In Puerperal Fever.*—The use of the oil of turpentine as a specific in this disease was introduced by Dr. Brenan of Dublin (*Thoughts on Puerperal Fever, and its Cure by Spirits of Turpentine:* Lond. 1814); and strong testimonies were subsequently borne to its efficacy by several highly respectable practitioners. Vide Bayle's (*Bibl. Thérap.* t. iv.) Dr. Brenan gave one or two table-spoonfuls of the oil, every three or four hours, in cold water, sweetened; and applied flannel soaked in the oil, to the abdomen. But the apparent improbability of a stimulant like turpentine curing an inflammatory disease, has prevented many practitioners placing any faith in it, or even giving it a trial. In other instances the unconquerable aversion which patients have manifested to it, has precluded its repetition. Lastly, it has failed, in the hands of some of our most accurate observers, to produce the good effects which Dr. Brenan and others have ascribed to it, and in some instances has appeared to aggravate the malady. These reasons have been conclusive against its employment, at least in the way advised by Dr. Brenan. But there are two valuable uses which may be made of turpentine, in puerperal fever: it may be given in the form of clyster, to relieve a tympanitic condition of the intestines, and for this purpose no remedy perhaps is superior to it; secondly, flannel soaked in the hot oil may be applied to the abdomen, to cause rubefaction, as a substitute for a blister, to the employment of which several objections exist.

5. *In Ordinary Fever.*—As a powerful stimulant in some forms of low fever, oil of turpentine has been well spoken of by Dr. Holst (*Hufeland's Journ.* Bd. 20, St. 2, S. 146), Dr. Chapman, (*Elem. of Therap.* vol. ii. p. 129, 4th ed.), Dr. Douglas (*Dubl. Hosp. Rep.* vol. iii.), and more recently by Dr. Wood (*North Amer. Med. and Surg. Journ.* April 1826). When the skin is dry, the bowels flatulent, and ulceration of the mucous membrane suspected, it often proves most serviceable.

6. *In Rheumatism.*—In chronic rheumatism oil of turpentine has long been celebrated. Its beneficial influence depends on its stimulant and diaphoretic operation, and is more likely to be evinced in old and debilitated persons. I have found medium doses occasionally succeed when small ones had failed. But for the most part I have not met with that success with it in chronic rheumatism, to induce me to place much confidence in it. In the form of liniment it has often proved serviceable.

7. *In Sciatica and other Neuralgic affections.*—Oil of turpentine was proposed as a remedy for sciatica by Drs. Pitcairn and G. Cheyne. Its efficacy was subsequently confirmed by Dr. Home (*Clin. Experiments*). More recently it has been extensively employed, and with great success, in France, in sciatica as well as in various other neuralgias (Martinet, *Lond. Med. and Phys. Journ.* March 1829; Bayle, *Bibl. Thérap.* t. iv.) But it has proved more successful in those which affect the lower extremities. My own experience does not lead me to speak very favourably of it. In a disease the pathology of which is so imperfectly understood as is that of neuralgia, it is in vain to attempt any explanation of the *methodus medendi* of an occasional remedy for it. I have known oil of turpentine now and then act most beneficially in sciatica, without giving rise to any remarkable evacuation by the bowels, skin, or kidneys, so

that the relief could not be ascribed to a cathartic, a diaphoretic, or a diuretic operation.

8. *In Suppression of Urine.*—I have seen oil of turpentine succeed in reproducing the urinary secretion when other powerful diuretics had failed.

9. *In Infantile Diabetes.*—Dr. Dewees (*Treatise on the Phys. and Moral Treatm. of Childr.*) has cured three cases of diabetes [?] in infants under fifteen months old, "by keeping the bowels freely open, and putting a quantity of the spirits of turpentine upon the clothes of the children, so as to keep them in a terebinthinate atmosphere."

10. *In Nephritic Diseases.*—In some diseases of the kidneys, as ulceration, the use of oil of turpentine has been much extolled. It has proved successful in renal hydatids (Bayle, *op. cit.*)

11. *In Dropsy.*—Oil of turpentine has occasionally proved serviceable in the chronic forms of this disease (see the authorities quoted by Dr. Copland, *Lond. Med. and Phys. Journ.* vol. xlvi. p. 201). Its efficacy depends, in part, on its derivative operation as a stimulating diuretic; and in part, as I conceive, on its powerful influence over the capillary and secerning vessels, by which it exercises a direct power of checking effusion. It is inadmissible, or is contraindicated, in dropsies accompanied with arterial excitement, or with irritation of stomach or of the urinary organs. When the effusion depends on obstruction to the return of venous blood, caused by the pressure of enlarged or indurated viscera, tumors, &c. turpentine can be of no avail. But in the atonic forms of dropsy, especially in leucophlegmatic subjects, attended with deficient secretion of the skin and kidneys, this oil is calculated to be of benefit. Dr. Copland (*op. cit.* p. 202) has used it in the stage of turgescence, or invasion of acute hydrocephalus, as a drastic and derivative.

12. *In Spasmodic Diseases.*—Oil of turpentine has been employed successfully in the treatment of epilepsy, by Drs. Latham, Young, Ed. Percival, Lithgow, Copland, and Prichard (Copland's *Dict. of Pract. Med.* p. 806). No benefit can be expected from this or any other medicine, when the disease depends on organic lesion within the osseous envelopes of the nervous centres. But when the disease is what Dr. Marshall Hall terms *centripetal* or *eccentric*, (as the convulsion of infants frequently is), that is, takes its origin in parts distant from the cerebro-spinal axis, which becomes affected only through the incident or excitor nerves, we can easily understand that benefit may be obtained by the use of agents like this, which, while it stimulates the abdominal viscera, operates as a cathartic and anthelmintic, and produces a derivative action on the head. A more extended experience of its use in chorea, hysteria, and tetanus, is requisite to enable us to speak with confidence of its efficacy in these diseases, though a few successful cases have been published (Copland, *Lond. Med. and Phys. Journ.* vol. xlvi. p. 199; Phillips, *Med.-Chir. Trans.* vol. vi.; Elliotson, *Lancet*, May 1830; Gibbon, *Lond. Med. Gaz.* vol. vii. p. 428).

13. *In Inflammation of the Eye.*—Mr. Guthrie (*Lond. Med. Gaz.* vol. iv. p. 509) has employed oil of turpentine in inflammation of the iris and choroid coat, on the plan recommended by Mr. Hugh Carmichael (*loc. cit.* vol. v. p. 836). In some cases, especially those of an arthritic

nature), it succeeded admirably; in others it was of little or no service. It was given in doses of a drachm, three times a day.

14. *In Tympanites.*—To relieve flatulent distension of the stomach and bowels, and the colic thereby induced, both in infants and adults, oil of turpentine is a most valuable remedy. It should be given in full doses, so as to act as a purgative; or when, from any circumstance, it cannot be exhibited by the mouth, it may be employed in the form of clyster. Dr. Ramsbotham (*Lond. Med. Gaz.* vol. xvi. p. 118) speaks in the highest terms of the efficacy of oil of turpentine in the acute tympanites of the puerperal state, and thinks that most of the cases of the so-called puerperal fever, which yielded to this oil, were in fact cases of acute tympanites; and in this opinion he is supported by Dr. Marshall Hall.

15. *In obstinate Constipation.*—Dr. Kinglake (*Lond. Med. and Phys. Journ.* vol. xlvi. p. 272), in a case of obstinate constipation, with a tympanitic condition of the intestines, found oil of turpentine a successful cathartic, after the ordinary means of treating these cases had been assiduously tried in vain. Dr. Paris (*Pharmacologia*) also speaks highly of it in obstinate constipation depending on affections of the brain.

16. *To assist the passage of Biliary Calculi.*—A mixture of three parts sulphuric ether and two parts oil of turpentine has been recommended as a solvent for biliary calculi (Durande, *Observ. sur l'Efficacité du Mélange d'Ether sulph. et d'Huile volatile de Téréb. dans Coliques hépat. produites par des Pierres Biliaires*, 1790). But there is no foundation for the supposition that the relief which may be obtained by the use of this mixture in icterus and during the passage of a biliary calculus, depends on the dissolution of the latter.

17. *As an External Remedy.*—Oil of turpentine is employed externally, as a *rubefacient*, in numerous diseases, on the principle of counter-irritation, before explained (p. 45). Thus, in the form of liniment, it is used, either hot or cold, in chronic rheumatism, sprains, sore throat, neuralgic affections of the extremities, &c. In the form of fomentation the hot oil is applied to produce redness of the skin in puerperal peritonitis, as I have already mentioned. As a powerful local *stimulant*, it was recommended by Dr. Kentish (*Essay on Burns*) as an application to burns and scalds, his object being to restore the part gradually, not suddenly, to its natural state, as in the treatment of a case of frost-bite. The practice is most successful when the local injury is accompanied with great constitutional depression. I can bear testimony to its efficacy in such cases, having employed it in several most severe and dangerous burns with the happiest results. In that form of gangrene which is not preceded by inflammation, and is called *dry* or *chronic*, oil of turpentine may occasionally prove serviceable, especially when the disease affects the toes and feet of old people. There are many other topical uses to which it has been applied; but as they are for the most part obsolete, at least in this country, I omit any further mention of them. They are fully noticed in the works of Voigtel (*Arzneimittell.* Bd. ii. S. 260) and Richter *Arzneimittell.* Bd. ii. S. 74). Oil of turpentine is the principal ingredient in *Whitehead's Essence of Mustard*, which contains also camphor and a portion of the spirits of rosemary. *St. John Long's liniment* consists of oil of turpentine and acetic acid, held in suspension by yolk of egg (Dr. Macreight, *Lancet* for 1837-8, vol. ii. p. 485).

Administration.—When given as a diuretic, and to affect the capillary and secerning vessels (in catarrhal affections of the mucous membranes, dropsy, suppression of urine, hemorrhage, &c.) the dose is from 6 or 8 minims to f℈j.; as a general stimulant (in chronic rheumatism, chorea, &c.) or to produce a change in the condition of the intestinal coats (in chronic dysentery), from f℈j. to f℈ij.; as an anthelmintic (in tape-worm) or as a revulsive (in apoplexy, in epilepsy previous to an expected paroxysm, &c.) from f℥ss. to f℥ij. It may be taken floating on some aromatic water, to which some hot aromatic tincture, as *tinctura capsici*, has been added; or it may be diffused through water by the aid of mucilage or an emulsion; or it may be made into a linctus with honey or some aromatic syrup.

1. *Enema Terebinthinæ*, L. E. D.; *Clyster of Turpentine.*—(Oil of Turpentine, f℥j.; Yolk of Egg, q. s. "Rub them together, and add, Decoction of Barley, f℥xix." *L.* The *Edinburgh College* substitute Water for Barley Water. The *Dublin College* directs ℥ss. of Common Turpentine to be rubbed with the Yolk of one Egg, and ten Ounces of Water, of a temperature not exceeding 100° F., to be added.) Used as an anthelmintic in ascarides; as an antispasmodic and purgative in colic, obstinate constipation, and tympanites. Dr. Montgomery (*Observ. on the Dubl. Pharm.*) says, "it is much used in cases of peritoneal inflammation."

2. *Linimentum Terebinthinæ*, L. D.; *Linimentum Terebinthinatum*, E. (Soft Soap, ℥ij.; Camphor, ℨj.; Oil of Turpentine, f℥xvj. "Shake them together until they are mixed," *L.*— Resinous Ointment, ℨiv.; Oil of Turpentine, f℥v.; Camphor, ℨss. "Melt the ointment, and gradually mix with it the camphor and oil, till a uniform liniment be obtained," *E.*—Ointment of White Resin, lb. j.; Oil of Turpentine, Oss. "Having melted the ointment, gradually mix the oil of turpentine with it, *D.*)—Introduced by Dr. Kentish (*Essay on Burns*) as a dressing for burns and scalds. The parts being first bathed with warm oil of turpentine, alcohol, or camphorated spirit, are to be covered with pledgets of lint thickly spread with this liniment. When the peculiar inflammation, excited by the fire, has subsided, milder applications are then to be resorted to. This liniment may also be used in any other cases requiring the employment of a more stimulant application than the ordinary soap liniment.

III. *Resinæ Terebinthinæ.—Terebinthinate Resins.*

1. *Resina*, L. E. D.—*Rosin* or *Common Resin.*

Preparation.—This is the residue of the process for obtaining oil of turpentine. It is run, while liquid, into metallic receivers coated with whiting to prevent adhesion, and from these is ladled into wooden moulds or casks. When the distillation is not carried too far, the product contains a little water, and is termed *yellow rosin* (*resina flava*). A more continued heat expels the water and produces *transparent rosin*; and if the process be pushed as far as it can be, without producing a complete alteration of properties, the residue acquires a deep colour, and is termed *brown* or *black rosin* or *colophony* (*resina nigra* seu *colophonium*). If melted rosin be run into cold water contained in shallow tanks, and a supply of cold water be kept up until the rosin has solidified, a pale yellow product is obtained, called *Flockton's patent rosin.*

PROPERTIES.—Rosin is compact, solid, brittle, almost odourless and tasteless, with a smooth shining fracture, becomes electric by friction, is fusible at a moderate heat, decomposable at a higher temperature, yielding among other products a volatile oil (Luscombe's *rosin oil*) and an inflammable gas (Daniell's *rosin gas*), and burning in the air with a yellow smoky flame. It is insoluble in water, but soluble in alcohol, ether, and the volatile oils. With wax and the fixed oils it unites by fusion; with the caustic alkalies it unites to form a *resinous soap* (the *alkaline resinates*, principally the *pinates*). Heated with concentrated sulphuric or nitric acid mutual decomposition takes place.

Yellow rosin is opaque and yellow, or yellowish-white. Its opacity is owing to water, with which it is incorporated. By continued fusion this is got rid of, and the rosin then becomes transparent (*transparent rosin*). *Brown rosin* or *colophony* is more or less brown and transparent.

COMPOSITION.—Rosin is a compound or mixture of *pinic acid* (principally) *colophonic acid* (variable in quantity), *sylvic acid* (a small quantity), and traces of *an indifferent resin* (Unverdorben, in Gmelin, *Hand. d. Chim.* ii. 520).

1. *Pinic acid.*—May be regarded as an oxide of oil of turpentine. It is soluble in cold alcohol of sp. gr. 0·883. The solution forms a precipitate (*pinate of copper*) on the addition of an alcoholic solution of acetate of copper. *Pinate of magnesia* dissolves with difficulty in water. The ultimate composition of pinic acid (the essential constituent of rosin) is as follows (Dumas, *Traité de Chim.* t. v. p. 686:—

	Eq.	Eq. wt.	Per cent.
Carbon	40	240	78·9
Hydrogen	32	32	10·5
Oxygen	4	32	10·5
Pinic acid	1	304	99·9

2. *Colophonic acid.*—Formed by the action of heat on pinic acid, and, therefore, the quantity of it contained in rosin varies according to the heat employed. Rosin owes its brown colour to it. It is distinguished from pinic acid by its greater affinity for salifiable bases, and its slight solubility in alcohol (Berzelius, *Traité de Chim.* t. v. p. 489).

3. *Sylvic acid.*—Is isomeric with pinic acid, from which it is distinguished by its insolubility in cold alcohol of sp. gr. 0·883.

4. *Indifferent resin.*—Is soluble in cold alcohol, oil of petroleum, and oil of turpentine. It forms with magnesia a compound readily soluble in water.

PHYSIOLOGICAL EFFECTS.—Not being used internally, its effects when swallowed are scarcely known. It is probable, however, that they are of the same kind as those of common turpentine, though very considerably slighter. In the horse it acts as a useful diuretic, in doses of five or six drachms (Youatt, *The Horse*, in the *Libr. of Useful Knowl.*) Its local influence is very mild. "It may be considered," says Dr. Maton (Lambert's *Pinus*), "as possessing astringency without pungency."

USE.—Powdered rosin has been applied to wounds to check hemorrhage, and is occasionally used for this purpose in veterinary practice. But the principal value of rosin is in the formation of plasters and ointments, to which it communicates great adhesiveness and some slightly stimulant properties.

1. CERATUM RESINÆ, L., *Unguentum Resinosum*, E., *Unguentum Resinæ albæ*, D., *Yellow Basilicon* or *Basilicon Ointment*, offic.—(Resin; Wax, of each, lb. j.; Olive Oil, f℥xvj. Melt the Resin and the Wax together

with a slow fire; then add the Oil, and press the Cerate, while hot, through a linen cloth, *L.* The *Edinburgh College* orders of Resin, ℥v. Axunge, ℥viij., Bees' wax, ℥ij. Melt them together with a gentle heat, and then stir the mixture briskly while it cools and concretes. The *Dublin College* directs of Yellow Wax, lb. j., White Resin, lb. ij., prepared Hogs' Lard, lb. iv. Make an ointment, which, while yet hot, should be strained through a sieve).—A mildly stimulant, digestive, and detergent application to ulcers which follow burns, or which are of a foul and indolent character, and to blistered surfaces to promote a discharge.

2. *Emplastrum Resinæ*, L., *Emplastrum Resinosum*, E., *Emplastrum Lithargyri cum Resinâ*, D.—Has been already described, p. 521.

2. *Pix burgun'dica*, E. D.—*Burgundy Pitch.*

Pix abietina, *L.*

Preparation.—True Burgundy pitch is prepared by melting common frankincense (*Abietis resina*, L., *Thus*, D.) in hot water, and straining through a coarse cloth. By this process part of the volatile oil and the impurities are got rid of. The substance sold as Burgundy pitch in the shops is rarely prepared in this way, but is fictitious. Its principal constituent is rosin, rendered opaque by the incorporation of water, and coloured by palm oil. One maker of it informed me that he prepared it from old and concrete American turpentine.

Properties.—Genuine Burgundy pitch is hard, brittle when cold, but readily taking the form of the vessel in which it is kept. It softens by the heat of the hand, and strongly adheres to the skin. Its colour is yellowish white; its odour is not disagreeable; its taste slightly bitter. Fictitious Burgundy pitch is usually of a fuller yellow colour than the genuine, and has a somewhat less agreeable odour.

Composition.—Consists of *resin* principally, and a small quantity of *volatile oil.*

Physiological Effects.—Its effects are similar to those of the other terebinthinate resins. In activity it holds an intermediate station between common turpentine and rosin, being considerably less active than the first, and somewhat more so than the last of these substances. Its local action is that of a mild irritant. In some persons it excites a troublesome vesiculo-pustular inflammation (Rayer, *Treat. on Diseases of the Skin*, by Dr. Willis, p. 366).

Uses.—It is employed as an external agent only, spread on leather, forming the well-known *Burgundy pitch plaster* (*emplastrum picis burgundicæ*), which is applied to the chest in chronic pulmonary complaints, to the loins in lumbago, to the joints in chronic articular affections, and to other parts to relieve local pains of a rheumatic character. It acts as a counter-irritant or revulsive.

Emplastrum Picis, L. E.—Burgundy Pitch, lb. ij.; Resin of the Spruce Fir, [Thus] lb. i.; Resin; Wax, of each, ℥iv.; Expressed Oil of Nutmeg, ℥j.; Olive Oil; Water, of each, f℥ij. Add first the Resin of the Spruce Fir, then the Oil of Nutmegs, the Olive Oil, and the Water, to the Pitch, Resin, and Wax, melted together. Lastly, mix them all, and boil down to a proper consistence.—*L.* The formula of the *Edinburgh College* is as follows:—Burgundy Pitch, lb. iss.; Resin and Wax, of each, ℥ij.; Oil of Mace, ℥ss.; Olive Oil, f℥j; Water, f℥j. Liquify the Pitch, Resin, and Wax, with a gentle heat; add the other articles; mix them well together, and boil till the mixture acquires a proper consistence). Stimulant and rubefacient used in the same cases as the simple Burgundy Pitch.

IV. *Pix liquida* and *Pix solida*—*Tar* and *Pitch.*

1. *Pix liquida*, L. E. D.—*Vegetable Tar.*

History.—This is the πίττα of Theophrastus (*Hist. Plant.* lib. ix. cap. ii. & iii), the πίσσα ὑγρα (*liquid pitch*), or κῶνος, of Dioscorides (lib. 1, cap. xciv.), and the *pix liquida* of Pliny (*Hist. Nat.* lib. xxiv. cap. 24, ed. Valp.)

Preparation.—The process now followed seems to be identical with that practised by the Macedonians, as described by Theophrastus. It is a kind of *distillatio per descensum* of the roots and other woody parts of old pines. As now carried on in Bothnia, it is thus described by Dr. Clarke (*Travels in Scandinavia*, part 3, p. 251):—"The situation most favourable to the process is in a forest near to a marsh or bog, because the roots of the fir, from which tar is principally extracted, are always most productive in such places. A conical cavity is then made in the ground (generally in the side of a bank or sloping hill); and the roots of the fir, together with logs and billets of the same, being neatly trussed in a stack of the same conical shape, are let into this cavity. The whole is then covered with turf, to prevent the volatile parts from being dissipated, which, by means of a heavy wooden mallet and a wooden stamper, worked separately by two men, is beaten down, and rendered as firm as possible about the wood. The stack of billets is then kindled, and a slow combustion of the fir takes place, without flame, as in working charcoal. During this combustion the tar exudes, and a cast-iron pan being at the bottom of the funnel, with a spout which projects through the side of the bank, barrels are placed beneath this spout to collect the fluid as it comes away. As fast as the barrels are filled, they are bunged, and ready for immediate exportation."— See also Duhamel's *Traité des Arbres.*)

Commerce.—Tar is brought to this country in barrels, each holding $31\frac{1}{2}$ gallons: twelve barrels constitute a *last.* The quantities imported in the years 1830 and 1831, were as follows.—(*Parliamentary Return of Imports and Exports* for 1830 and for 1831):—

Countries from whence imported.	1830.		1831.	
	Lasts.	Barrels.	Lasts.	Barrels.
Russia	9,675	6	7,779	6
Sweden	580	8	1,086	1
Norway	88	7	22	6
Denmark	307	7	439	9
Germany	17	6	—	—
United States of America	1,521	7	1,243	2
Isles of Guernsey, Jersey, Alderney, and Man (Foreign Goods)	14	8	1	0
Total	12,206	1	10,572	0

Properties.—It is a dark brown, viscid, semi-liquid substance, which preserves during a long period its softness. It is soluble in alcohol, ether, and the oils both fixed and volatile. Submitted to distillation, it yields an acid liquor (*pyroligneous acid*), and a volatile oil (*oil of tar*): the residue in the still is *pitch*. *Oil of tar* is brownish, and consists of oil of turpentine, impregnated with pyrogenous oil and resin.

Composition.—Vegetable tar consists of *several pyrogenous resins*, combined with *acetic acid*, of *colophony*, *oil of turpentine*, and *pyrogenous oil*. The liquidity of tar is owing to the two last-mentioned constituents, which hold the resins in solution (Berzelius, *Traité de Chim.* t. vi. p. 680).

Physiological Effects.—The effects of tar are analogous to those of turpentine, but modified by the presence of acetic acid and the pyrogenous products. Locally it acts as a stimulant, and, when applied to chronic skin diseases and indolent ulcers, it frequently induces a salutary change in the action of the capillary and secerning vessels, evinced by the improved quality of the secretions, and the rapid healing of the sores. In such cases it is termed detergent, digestive, or cicatrisant. Swallowed, it acts as a local irritant and stimulant, becomes absorbed, and stimulates the secreting organs, especially the kidneys, on which it operates as a diuretic. Slight (Wibmer, *Wirk d. Arzneim*, Bd. iv. S. 215) states that a sailor swallowed a considerable quantity of liquid tar, which caused vomiting, great lassitude, and violent pain in bowels and kidneys. The urine was red, and, as well as the other evacuations, had the odour of tar. The head and the pulse were unaffected. The *vapour of tar*, inhaled, acts as a stimulant and irritant to the bronchial membrane, the secretion of which it promotes.

Uses.—Tar is rarely employed *internally*. It has, however, been administered in chronic bronchial affections, and in obstinate skin diseases.

The *inhalation of tar vapour* was recommended by Sir Alexander Crichton (*Pract. Observ. on the Treatm. and Cure of several varieties of Pulm. Consump. and on the Effects of the Vapour of boiling Tar in that Disease*, 1823) in phthisis; but at best it can prove only a palliative, and it frequently, perhaps generally, fails to act even thus, and in some cases occasions a temporary increase of cough and irritation (Dr. Forbes, Transl. of Laennec's *Treat. on Diseases of Chest*, p. 365). In chronic, laryngeal, and bronchial affections, it has more chance of doing good (Trousseau and Pidoux, *Traité de Thérap.* t. i. p. 459). The mode of using tar fumigation I have before described (p. 51).

Applied *externally* tar is used in various forms of obstinate skin diseases, especially those which affect the scalp, lepra, &c.

Administration.—Internally, tar is administered in the form of pills made up with wheat flour, or in that of electuary, with sugar. It may be taken to the extent of several drachms daily.

1. *Aqua Picis liquidæ*, D., *Tar Water*.—(Tar, Oij.; Water, Cong. j. Mix, stirring with a stick for a quarter of an hour; then, as soon as the tar subsides, strain the liquor, and keep it in well-stopped jars). Tar water has the colour of Madeira wine, and a sharp empyreumatic taste. It consists of water holding in solution acetic acid, and pyrogenous oil and resin. Notwithstanding the high eulogies passed on it by Bishop Berkeley (*Siris: A Chain of Phil. Reflex. and Inq. concern. Tar Water*), tar water is now rarely employed. It is occasionally administered in chronic, catarrhal, and nephritic complaints, to the extent of one or two

pints daily. As a wash in chronic skin diseases, especially those affecting the scalps of children, I have frequently seen it used, and sometimes with apparent benefit.

2. *Unguentum Picis liquidæ*, L. E. D.; *Tar Ointment*.—(Tar, Mutton Suet, of each, lb. j. Melt them together, and press through a linen cloth [a sieve, *D*.] The *Edinburgh College* takes five ounces of Tar, and two ounces of Bees' Wax; and having melted the wax with a gentle heat, adds the tar, and stirs the mixture briskly, while it concretes on cooling). Its principal use is as an application to ring-worm of the scalp and scalled head; in which it sometimes succeeds, but more frequently fails, to cure. It is now and then applied to foul ulcers.

3. *Oleum Picis liquidæ* (*Oleum Pini rubrum; Oil of Tar*).—This is obtained by distillation from tar. It is a reddish, limpid fluid, having the odour of tar. By re-distillation it may be rendered colourless, and then becomes very similar to oil of turpentine. It is occasionally used as an application to ring-worm of the scalp and scalled head. Swallowed in a large dose it has proved fatal (*Lancet* for March 8th, 1834).

2. *Pix ni'gra*, L.—*Black Pitch*.

Pix arida, *E*.

History.—This is the πίσσα ξηρὰ (*dry pitch*) of Dioscorides (lib. i. cap. 97), which, he says, some call παλίμπισσα (*pitch boiled again*).

Preparation.—When vegetable tar is submitted to distillation, an acid liquor (*pyroligneous acid*) and a volatile oil (*oil of tar*) pass over: the residuum in the still is *pitch* (*Pix nigra*, L.)

Properties.—At ordinary temperatures it is a black solid, having a brilliant fracture. It softens at 99° F. and melts in boiling water. It dissolves in alcohol and in solutions of the alkalies and of the alkaline carbonates.

Composition.—Pitch is composed of *pyrogenous resin* and *colophony;* but principally of *pyretine* (Berzelius, *Traité de Chim.* t. vi. p. 680).

Physiological Effects.—Made into pills with flour or any farinaceous substance, pitch may be taken to a great extent, not only without injury, but with advantage to the general health. It affords one of the most effectual means of controlling the languid circulation, and the inert and arid condition of the skin (Bateman, *Synopsis of Cutaneous Diseases*, p. 53, 6th ed.) As a local remedy it possesses great adhesiveness, and when applied to wounds and ulcers acts as a stimulant and digestive.

Uses.—Bateman (*op. cit.*) speaks favourably of the internal use of pitch in *ichthyosis*. It has been employed also in other obstinate skin diseases. But the principal use of pitch is in the form of ointment, as an application to cutaneous affections of the scalp.

Administration.—Dose from grs. x. to ℈j. made into pills with flour. The unpleasant pitchy flavour of the pills is materially diminished by keeping them for some time.

Unguentum Picis nigræ, L.; *Unguentum Basilicum nigrum* vel *Tetrapharmacum*.—(Black Pitch, Wax, Resin, of each ℥ix.; Olive Oil, f℥xvj. Melt them together, and press through a linen cloth). Stimulant and digestive; used in the obstinate cutaneous eruptions of the scalp. (Vide *Unguentum Picis liquidæ*.)

Junip'erus commu'nis, Linn. L. E. D.—*The Common Ju'niper.*

Sex. Syst. Diœcia, Monadelphia.

(Cacumina; Fructus, *L.* Cacumina; Fructus; Oleum, *E.* Cacumina; Baccæ, *D.*

History.—It is very questionable whether this shrub is mentioned in the Old Testament, though its name occurs in several places (*Job*, ch. xxx. v. 4, 1 *Kings*, ch. xix. v. 4, in our translation). The fruit, called by the Greeks ἀρκευθὶς, and used by Hippocrates in some disorders of females, was the produce of a species of *Juniperus*; either *J. communis*, which Dr. Sibthorpe (*Prod. Fl. Græcæ*) found growing on Olympus and Athos; or *J. phœnicia*, which is very common in Greece and the islands of the Archipelago, and whose fruit is yellowish, but has the size, form, and powers of that of the common juniper.

Botany. *Gen. Char.*—*Diœcious*, rarely *monœcious*. *Males:*—*Catkins* ovate; the *scales* verticillate, peltato-pedicellate. *Anthers* four to eight, unilocular. *Females:*—*Catkins* globose; the three concave scales united. *Stigma* gaping. *Galbulus*, composed of the united and fleshy scales, and containing three triquetrous, osseous *seeds*.

Sp. Char.—*Leaves* three in a whorl, mucronate, spreading or imbricated, longer than the galbulus.

A bushy *shrub*. *Leaves* evergreen, numerous, linear, pungent, glaucous on the upper side, dark green beneath. *Flowers* axillary, sessile, small; the *males* discharging a copious cloud of yellow pollen: *females* green, on scaly stalks. *Fruit* commonly called *a berry*, but is in reality that kind of cone, called by botanists a *galbulus*, which has fleshy, coalescent carpella, whose heads are much enlarged. It requires two seasons to arrive at maturity.

Two varieties (some botanists consider them to be distinct species) are described.

α. *J. communis*, Smith.—*Stem* erect. *Leaves* spreading. *Fruit* scarcely more than half the length of the leaves.

β. *J. nana*, Smith.—*Stem* procumbent. *Leaves* imbricated. *Fruit* nearly as long as the leaves.

Hab.—North of Europe. Indigenous, growing on hills and heathy downs, especially where the soil is chalky. It flowers in May.

Description.—In this country the *fruit* and *tops*, on the continent the *wood* also, are officinal.

Juniper berries (*baccæ juniperi*), as the dried fruit of the shops is commonly termed, are about the size of a pea, of a blackish-purple colour, covered by a glaucous bloom. They are marked—superiorly, with a triradiate groove, indicating the adhesion of the succulent carpella—inferiorly, with the bracteal scales, which assume a stellate form. They contain three seeds. Their taste is sweetish, with a terebinthinate flavour; their odour is agreeable and balsamic. *Juniper tops* (*cacumina* seu *summitates juniperi*) have a bitter, terebinthinate flavour, and a balsamic odour. *Juniper wood* (*lignum juniperi*) is obtained either from the stem or root; it evolves a balsamic odour in burning, and, by distillation with water, yields volatile oil. On old stems there is sometimes found a resinous substance (*resina juniperi; sandaraca germanica*).

Commerce.—Juniper berries are imported in bags and barrels from

Rotterdam, Hamburgh, Leghorn, Trieste, and other European ports. In 1838, duty (2s. *per cwt.*) was paid on 5896 *cwts.*

COMPOSITION.—Juniper berries were analyzed in 1822 by Trommsdorf (Gmelin's *Handb. d. Chem.* ii. 1330); and in 1831 by Nicolet (*Thomson's Org. Chem.* p. 899). Trommsdorf obtained *volatile oil* 1·0, *wax* 4·0, *resin* 10·0, *a peculiar species of sugar with acetate and malate of lime* 33·8, *gum with salts of potash and lime* 7·0, *lignin* 35·0, *water* 12·9, (*excess* 3·7).

1. *Oil of Juniper* (*Oleum Juniperi*) may be obtained by submitting the fruit, tops, or wood, to distillation with water. The full-grown green fruit yields more than the ripe fruit; for, in the act of ripening, a portion of the oil becomes converted into resin. It is limpid, transparent, nearly colourless, and lighter than water. It has the odour of the fruit and an aromatic, balsamic taste. It dissolves with difficulty in alcohol. According to Blanchet, it consists of two isomeric oils: one colourless, and more volatile; a second coloured, and less volatile. The composition of oil of juniper is analogous to that of oil of turpentine, being $C^{10} H^{8}$.

2. *Resin.*—Is green, according to Trommsdorf. Nicolet obtained it in the crystallized state, and found it to consist of $C^{5} H^{2} O^{1}$.

3. *Wax.*—Is brittle. Consists, according to Nicolet, of $C^{13} H^{8\frac{1}{2}} O^{1}$.

4. *Sugar.*—Is crystallizable, and analogous to grape sugar, according to Trommsdorf. But Nicolet describes it as being like molasses.

PHYSIOLOGICAL EFFECTS.—Juniper berries and tops are analogous in their operation to the terebinthinate substances. Three ounces of the berries act on the larger herbivorous animals as a diuretic (Moiroud, *Pharm. Vétér.*) On man, also, these fruits operate on the urinary organs, promoting the secretion of urine, to which they communicate a violet odour (Cargillus, in Ray, *Hist. Plant.* t. ii. p. 1412). In large doses, they occasion irritation of the bladder and heat in the urinary passages. Piso (Murray, *App. Med.*) says, their continued use causes bloody urine. They promote sweat, relieve flatulency, and provoke the catamenia. Their activity is principally dependent on the volatile oil which they contain; and which, according to Mr. Alexander's experiments (*Exper. Essays*, p. 149, 1768), is, in doses of four drops, the most powerful of all the diuretics (see his *Table*, at p. 94).

USES.—Juniper berries or oil are but little used in medicine. They may be employed either alone or as adjuncts to other diuretic medicines, *in dropsical disorders* indicating the employment of renal stimuli. Van Swieten (*Commentaries*, Eng. ed. 12mo. vol. xii. p. 431) speaks favourably of their use in mild cases of ascites and anasarca. *In some affections of the urino-genital apparatus*, juniper may be employed with advantage. Thus, in mucous discharges (as gonorrhœa, gleet, leucorrhœa, and cystirrhœa), it may be used under the same regulations that govern the employment of copaiva and the terebinthinates. Hecker (*Anweisung d. vener. Krankh.* quoted by Voigtel, *Arzneim.* Bd. 2, Abt. 2, S. 510) praised it in the first stage of gonorrhœa.

Juniper has been advised in some other diseases, but I do not think it necessary to enumerate them. (Consult on this subject Vogt, *Lehrb. d. Pharmakodyn.*; Richter, *Arzneimittell*; and Sundelin, *Spec. Heilmittell*).

ADMINISTRATION.—The dose of the *berries* is one or two drachms triturated with sugar. The *infusion* (prepared with an ounce of the berries and a pint of boiling water) is a more convenient mode of exhibition; the dose is f℥iv. every four hours.

1. *OLEUM JUNIPERI*, L. E. D.—The mode of preparing and the pro-

perties of this oil have been already noticed. It is, perhaps, the best form for exhibiting juniper. The dose is two to six drops, either in the form of pill, or diffused through water by the aid of sugar and mucilage.

2. *Spiritus Juniperi compositus*, L. E. D.—(Juniper berries, bruised, ℥xv. [lb. j. *E. D.*]; Caraway, bruised; Fennel bruised, of each, ℥ij. [℥iss. *E. D.*]; Proof Spirit, Cong. j. [Ovij. *E.*]; Water, Oij. [as much as may be convenient, *D.*] Mix; then, with a slow fire, let a gallon distil, *L.* The *Edinburgh* and *Dublin* Colleges order the fruit to be macerated in the spirit [for two days, *E.*; for twenty-four hours, *D.*], the water then added, and [seven pints, *E.*, a gallon, *D.* of] the spirit distilled). This preparation, when sweetened, may be regarded as an officinal substitute for *genuine Hollands* and *English Gin*, both of which compounds are flavoured with juniper. It is used as an adjunct to diuretic mixtures. The dose is f℥ij. to f℥iv.

Junip'erus Sabi'na, Linn. L. E. D.—*Common Savin.*

Sex. Syst. Diœcia, Monadelphia.
(Cacumina recentia et exsiccata, *L.* Tops, *E.* Folia, *D.*)

History. — This is the βράθυς of Dioscorides (lib. i. cap. 104), the *sabina* of Pliny, (*Hist. Nat.* lib. xxiv. cap. 61, ed. Valp.) Both these writers notice the two varieties of this plant.

Botany. *Gen. Char.*—Vide *Juniperus communis.*

Sp. Char.—*Leaves* ovate, convex, densely imbricated, erect, decurrent, opposite; the oppositions pyxidate (*Bot. Gall.*)

A small, bushy *shrub*. *Branches* closely inverted by the very small, glandular *leaves*. *Galbulus* round, purple, somewhat smaller than that of Juniperus communis.

Two varieties are distinguished (Nees and Eberm. *Handb.*):—

α. *J. Sabina cupressina.*—*Leaves* acute, more spreading, three lines long.
β. *J. Sabina tamariscifolia.*—*Leaves* shorter, almost appressed and obtuse.

Hab.—Midland and southern parts of Europe; Asiatic Russia. Cultivated in gardens in this country. Flowers in April.

Description.—The officinal parts of the plant are the *tops* (*cacumina; summitates*), which consist of the young branches with their attached leaves. They have in the fresh state (*cacumina recentia*) a strong, peculiar, heavy odour, especially when rubbed; and a nauseous, resinous, bitter taste. The dried tops (*cacumina exsiccata*) are yellowish-green, and less odorous than the fresh ones.

Composition.—Some experiments on the composition of savin were made by Berlisky (*Trommsdorf's Journ.* viii. 1. 94). In 1837 an analysis of this plant was made by a young chemist of the name of Gardes (*Journ. de Chim. Méd.* t. iii. p. 331, 2nde Sér). The constituents are *Volatile oil, Resin, Gallic acid, Chlorophylle, Extractive, Lignin, and Salts of Lime.*

Oil of Savin (*Oleum Sabinæ*) is obtained by submitting the fresh tops to distillation with water. It is a limpid, almost colourless liquid, having the unpleasant odour of the plant, and a bitter, acrid taste. Its sp. gr. is 0·915. Its composition is analogous to that of oil of turpentine, being $C^{10}H^8$.

Chemical Characteristics.—An aqueous infusion of savin is yellowish, has the odour and bitter taste of the herb, and forms a soluble green compound (*gallate? of iron*) on the addition of sesquichloide of iron, but is unchanged by a solution of gelatin. Oxalate of ammonia causes in the infusion a white precipitate (*oxalate of lime*). Alcohol acquires a green colour when digested with the tops; on the addition of water to the alcoholic tincture some *resin* is separated. By distillation with water both the fresh and dried tops (but especially the first) yield *volatile oil*.

Physiological Effects. (*a.*) *On animals.*—Savin acts on animals as an acrid poison. Orfila (*Toxicol. Gén.*) applied two drachms of the powder to an incised wound in the leg of a dog; inflammation and infiltration of the limb took place, and death occurred in about thirty-six hours. Four drachms introduced into the stomach of a dog, and the œsophagus tied, caused death in thirteen hours; the stomach was bright red, and the rectum a little inflamed. Orfila infers that its effects depend principally on its absorption, and its action on the nervous system, the rectum, and the stomach. A drachm of *oil of savin* was given by Hillefield (Wibmer, *Wirk. d. Arzneim. u. Gifte*, Bd. iii. H. 1, p. 191) to a cat. It caused a flow of saliva, anxiety, frequent discharge of urine, dulness, trembling, and, in an hour and a quarter, bloody urine. The animal having been strangled, the bladder was found contracted, with some coagulated blood contained in its cavity.

(*b.*) *On man.*—Oil of savin, the active principle of the herb, is a powerful local irritant. When applied to the skin, it acts as a rubefacient and vesicant. On wounds and ulcers, its operation is that of an acrid (not chemical) caustic. Swallowed in large doses, it occasions vomiting, purging, and other symptoms of gastro-intestinal inflammation. In its operation on the system generally, it is powerfully stimulant. "Savin," says Sundelin (*Heilmittellehre*, Bd. ii. S. 180, Auf. 3tte), "operates not merely as irritants generally do, as a stimulant to the arterial system, but it also eminently heightens the vitality of the venous system, the circulation in which it quickens. It next powerfully stimulates the absorbing vessels and glands, the serous, the fibrous, and the mucous membranes, and the skin. It operates as a specific excitant and irritant on the kidneys, and yet more obviously on the uterus. The increased secretion of bile and the augmented volume of the liver, both of which conditions have sometimes been observed after the copious and long-continued use of savin, appear to be connected with its action on the venous system." Mohrenheim (Murray, *App. Med.* vol. i. p. 59) mentions the case of a woman, 30 years of age, who swallowed an infusion of savin to occasion abortion. Violent and incessant vomiting was induced. After some days she experienced excruciating pains, which were followed by abortion, dreadful hemorrhage from the uterus, and death. On examination, the gall-bladder was found ruptured, the bile effused in the abdomen, and the intestines inflamed. The popular notion of its tendency to cause abortion, leads, on many occasions, to the improper use of savin; and the above is not a solitary instance of the fatal consequences thereof. A fatal case of its use as an emmenagogue is recorded by Dr. Dewees (*Compend. Syst. of Midwifery*, pp. 133-4). That it may frequently fail to provoke premature labour is shewn by the case, related by Fodéré (*Méd. Lég.*), of a woman, who, in order to produce abortion, took every morning, for twenty days, one hundred drops of this oil, and yet went her full time, and brought forth a living child. It ought to be well known that in those cases in which it may succeed in causing miscarriage, it can only do so at the risk of the woman's life. Vogt (*Pharmakodyn.*) says that it has a tendency to induce an apoplectic state in the fœtus. The emmenagogue power of savin is fully established. Perhaps the observations of Home (*Clinic. Experiments*, p. 419) are the most satisfactory of any on this subject, confirmed as they are by the reports of many other accurate observers.

Uses.—Savin is not much used internally; but, in cases of amenorrhœa and chlorosis, depending on or accompanied by a torpid condition or deficient action of the uterine vessels, it may be given as a powerful uterine stimulant. In such cases it proves a most efficient remedy. According to my own observation, it is the most certain and powerful emmenagogue of the whole materia medica. My experience of it, therefore, confirms the statements of Home (*Clin. Experiments*). Though I have employed it in numerous cases, I never saw any ill effects result from its administration. Of course its use is contra-indicated where irritation of the uterus, or indeed of any of the pelvic viscera, exists.

In chronic rheumatism, with a languid circulation in the extreme vessels, Chapman (*Elem. of Therap.*) speaks in very high terms of it. It has been used as an anthelmintic.

As a topical agent, savin is frequently employed, mostly in the form of the cerate, to make *perpetual blisters.* Equal parts of savin and verdigris, in powder, form one of the most efficacious applications for the removal of venereal warts. The powder, an infusion, or the expressed juice of the plant, is occasionally applied to warts, to old and indolent ulcers, and in cases of psora and tinea.

Administration.—By drying, savin loses part of its volatile oil, and hence the *powder* is not the best preparation of it. It is, however, sometimes given in doses of from five to fifteen grains. A *decoction* and *extract* are also objectionable preparations, on account of the heat employed in making them. An *infusion* may be prepared by digesting ℥i. of the fresh herb in f℥viii. of boiling water: the dose is one or two table-spoonfuls. The *oil* is by far the most convenient and certain preparation of savin, and is the one which I always employ. A *conserve* of the fresh leaves is sometimes used.

1. *Oleum Sabinæ*, E. D.—(Obtained by distillation of the tops of savin). Its properties have been already noticed. The dose, as an emmenagogue, is from two to six drops, diffused in a mucilaginous or oleaginous mixture.

2. *Ceratum Sabinæ*, L. E.; *Unguentum Sabinæ*, D.—(Savin [fresh, *E.*; the leaves stripped from their stalks, *D.*], bruised, lb. i. [lb. ss., *D.*]; Wax, lb. ss.; Lard, lbs. ii. Mix the savin in the lard and wax melted together, then press through a linen cloth. The *Edinburgh* and *Dublin* colleges boil them [in the lard only, *D.*] together, until the leaves are crisp). The boiling is considered objectionable on account of the loss of a portion of the oil. The colour of this cerate should be fine green, and its odour that of the plant. Savin cerate is used as a dressing to blistered surfaces, to produce what is termed a *perpetual blister*. It is preferred to the ceratum cantharidis as being less acrid, and not liable to cause strangury. It is sometimes applied to seton tapes, to increase the discharge from setons.

Antidotes.—In a case of poisoning by savin herb or its oil, the first indication is to remove the poison from the stomach and bowels. Opiates and demulcent drinks should then be given. The warm bath may be advantageously employed. Bloodletting should be resorted to, if the inflammatory symptoms indicate, and the condition of system permit, it.

Other Medicinal Products of Coniferæ.

The leaf-buds of the Norway Spruce Fir (*gemmæ* seu *turiones abietis*), and the same parts of the Silver Fir (*gemmæ* seu *turiones pini*), are used, on the continent, in the form of decoction or beer; or, with the woods of guaiacum and sassafras, and juniper berries, in the form of tincture (*tinctura pini composita*, Ph. Bor.) They are employed in scorbutic, rheumatic, and gouty complaints.

Essence of Spruce (*essentia abietis* seu *essentia pini*) is prepared by boiling the young tops of some coniferous plant (in America, those of *Abies nigra* or *Black Spruce*, are used) in water, and concentrating the decoction by evaporation. "It is a thick liquid, having the colour and consistence of molasses, with a bitterish, acidulous, astringent taste" (*United States Dispensatory*). It is used in the preparation of spruce beer.

Spruce Beer (*cerevisia abietis* seu *cerevisia pini*) is thus prepared:—"Take of Essence of Spruce, *half a pint;* Pimento, bruised; Ginger, bruised; Hops, of each, *four ounces;* Water, *three gallons.* Boil for five or ten minutes; then strain, and add, of warm Water, *eleven gallons;* Yeast, *a pint;* Molasses, *six pints.* Mix, and allow the mixture to ferment for twenty-four hours" (*United States Dispensatory*). It is sometimes taken as an agreeable and wholesome drink in summer. It is diuretic and antiscorbutic, and is, in consequence, employed in long sea-voyages as a preventive of scurvy.

Juniperus virginiana, Linn., the *Red Cedar*, is used in the United States as a substitute for savin.

The resin called *sandarach* (*sandaraca*), or *gum juniper* (*gummi juniperi*), is imported from Mogadore. It is the produce of *Callitris quadrivalvis*, Vent. (*Thuja articulata*, Desf.) Though sold by chemists and apothecaries, it is not employed in medicine. It is used in the manufacture of varnishes. Its powder is *pounce*.

ORDER 22. BALSAMA'CÆ, *Lindley*.—THE LIQUIDAM'BAR TRIBE.

BALSAMIFLUÆ, *Blume.*

Though this order yields no officinal substance contained in the British pharmacopœias, yet the two balsamic oleo-resins, *liquidambar* and *liquid storax* (especially the latter), are frequently met with in the shops, and, therefore, require to be noticed.

1. *Balsam of Liquidambar* (*Balsamum liquidambar*, T. W. C. Martius; *Liquidambar*, Guibourt; *Copalm balsam*).—This is procured in Mexico and Louisiana by making incisions into the stem of *Liquidam'bar Styraci'flua.* The *liquid balsam* (*fluid liquidambar*, or *oil of liquidambar*, Guib.) is transparent, amber-yellow, has the consistence of a thick oil, a balsamic odour, and an aromatic, acrid, bitter taste. The *solid balsam* (*soft* or *white liquidambar*, Guibourt; *white balsam of Peru*, Auctor.) is a soft, almost opaque, solid, very similar in appearance to concrete turpentine. Its odour is similar to, though weaker, than the liquid balsam. Its taste is balsamic and sweetish. Bonastre analyzed a very fluid sample, recently received from America, and found it to consist of—*Volatile oil* 7·0, *semi-concrete matter* 11·1, *benzoic acid* 1·0, *crystalline matter soluble in water and alcohol* 5·3, *yellow colouring matter* 2·05, *oleo-resin* 49·0, *styracin* 24·0, loss 0·55. The volatile oil consists, according to Henry, of $C^{10}H^{7}$. Styracin is a fusible, crystalline substance, soluble in boiling alcohol, and composed, according to Henry, of $C^{11}H^{5}O^{2}$. The effects and uses of liquidambar are similar to those of other balsamic substances (vide p. 74). The dose of it is from ten to twenty grains.

2. *Liquid Balsam of Storax* (*Styrax liquidus*, officin).—This is said to be procured from the *Liquidambar Altingia*, Blume, (*Altingia excelsa*, Noronha), a native of Java, where it is called *Ras-sama-la* (*Rasamalla* or *Rosa mallas*, Auct.) But, on referring to the books of a wholesale druggist, I find that all the storax (liquid and solid), which has been imported into this country during the last seven years, came from Trieste; and from this circumstance Dr. Lindley suspects that the liquid storax of the shops is the produce of *Liquidambar orientale*, a native of Cyprus, and other parts of the east of

Europe; but there is no reason to believe that liquid storax is obtained in Europe. Petiver (*Phil. Trans.* vol. xxvi. p. 44) says, that the tree which yields it is the *Rosa mallas*, and grows in Cobross, an island at the upper end of the Red Sea, near Cadess, which is three days' journey from Suez. The bark of this tree is removed annually, and boiled in salt-water until "it comes to a consistence like birdlime;" it is then separated, put in barrels (each holding 420 lbs.), and sent to Mocha, by way of Judda. Under the name of *storax*, I have met with two liquids :—*α*. A pellucid liquid, having the consistence and tenacity of Venice turpentine, a brownish yellow colour, a sweetish storax-like odour, different to that of liquidambar. A few particles of bran or saw-dust are intermixed with it. It was sold to me as *balsam*, or *balsam storax*, and I was informed that it had been imported in jars, each holding 14 lbs. It agrees with the *pure* or *fine liquid storax* of Hill, the *styrax liquida finissima* of Alston. Professor Guibourt, to whom I sent a sample, regards it as balsam of liquidambar, somewhat thickened by age. *β*. The second kind is the *common liquid storax* of the shops; the *impure* or *coarse liquid storax* of Hill; and, doubtless, is the variety referred to by Petiver. It is imported in casks, holding about 4 cwts. each. It is opaque, of a grey colour, has the consistence of birdlime, and the odour of storax, but frequently intermixed with an odour of naphtha. No complete analysis of it has been made. The following substances, however, are contained in it:—*Volatile oil, benzoic acid, resin, styracin, matter soluble in boiling alcohol* (wax?), *fragments of bark, and earthy matter.* Its effects and uses are similar to those of other balsamic substances (vide p. 74). Its dose is from ℈i. to ʒi.

ORDER 23. SALICA'CEÆ, *Lindley*.—THE WILLOW TRIBE.

SALICINEÆ, *Richard.*

ESSENTIAL CHARACTER.—*Flowers* unisexual, either monœcious or diœcious, amentaceous. *Stamens* distinct or monadelphous; *anthers* two-celled. *Ovary* superior, one or two-celled; *ovules* numerous, erect, at the base of the cell, or adhering to the lower part of the sides; *style* one or none; *stigmas* two. *Fruit* coriaceous, one or two-celled, two-valved, many-seeded. *Seeds* either adhering to the lower part of the axis of each valve, or to the base of the cell, comose; *albumen* none; *embryo* erect; *radicle* inferior. *Trees* or *shrubs*. *Leaves* alternate, simple, with deliquescent primary veins, and frequently with glands; *stipules* deciduous or persistent (Lindley).

PROPERTIES.—The astringency possessed by most willow barks is referable to tannic acid. The bitterness and tonic properties depend on salicine, populine, or some uncrystallizable principle.

Sa'lix, Linn.—*Willow*.

Sex. Syst. Diœcia, Diandria.

(Cortex e speciebus salicis diversis: cortex salicis, *offic.*)

HISTORY.—Dioscorides (lib. i. cap. 136) speaks of the astringent qualities of the Ἰτέα, or *Willow* (? *Salix alba*), which was employed in medicine by the ancients. For a long series of years it fell into disuse, but was again brought into notice in 1763 by the Rev. Mr. Stone (*Phil. Trans.* vol. liii. p. 195), who published a paper on the efficacy of the bark of *Salix alba*, as a remedy for agues.

BOTANY. *GEN. CHAR.*—*Flowers* diœcious, or rarely monœcious, amentaceous: *scales* imbricated: a *gland* surrounding the stamens or ovary. *Males*:—*Stamens* two to five, usually two, sometimes the two united into one, and then the anther is four-celled. *Females*:—*Seeds* comose; the *radicle* inferior (*Bot. Gall.*)

SPECIES.—Sir J. E. Smith (*Engl. Flora*, iv.) mentions sixty-four indigenous species of Salix; but pharmacological and botanical writers are not agreed as to which species possesses the most medicinal power. The best practical rule to follow is this:—Select those whose barks possess great bitterness, combined with astringency. The following are those which are in the greatest repute:—

Fig. 143.

Salix Russelliana.

1. *Sa'lix Russellia'na*, Smith; *the Bedford Willow.—Leaves* lanceolate, tapering at each end, serrated throughout, very smooth. *Footstalks* glandular or leafy. *Germen* tapering, stalked, longer than the scales. *Style* as long as the stigmas (Smith). A *tree.* In marshy woods, wet meadows, &c., in various parts of Britain. Flowers in April and May. Its bark abounds in tannic acid. On account of its astringency, Sir J. E. Smith regards it as the most valuable officinal species; and he observes, that if it has occasionally disappointed medical practitioners, they probably chanced in such cases to give the *S. fragilis.*

Fig. 144.

Salix alba.

2. *Sa'lix al'ba*, Linn., D.; *the Common White Willow.—Leaves* elliptic-lanceolate, pointed, serrated, silky on both sides; the lowest serratures glandular. *Stamens* hairy. *Germen* smooth, almost sessile. *Stigmas* deeply cloven. *Scales* rounded (Smith). A tall *tree.* River-sides, moist woods, &c., in various parts of Britain. Flowers in May. Its bark, called *cortex salignum,* or *cortex anglicanum* of some writers, is astringent, but less so than that of the preceding species.

3. *Sa'lix Ca'prea*, Linn., E. D.; *Great Round-leaved Willow.—Stem* erect. *Leaves* roundish-ovate, pointed, serrated, waved; pale and downy beneath. *Stipules* somewhat crescent-shaped. *Catkins* oval. *Germen* stalked, ovate, silky. *Stigmas* nearly sessile, undivided. *Capsules* swelling (Smith). *Tree.* Indigenous, very common; growing in woods and hedges. Flowers in April.

4. *Sa'lix frag'ilis*, Linn. D.; *the Crack Willow.—Leaves* ovate-lanceolate, pointed, serrated throughout, very smooth. *Footstalks* glandular. *Germen* ovate, abrupt, nearly sessile, smooth. *Scales* oblong, about equal to the stamens and pistils. *Stigmas* cloven, longer than the style (Smith). *Tree.* Indigenous: about the banks of rivers. Flowers in April and May.

5. *Sa'lix pentan'dra*, Linn.; *Sweet Bay-leaved Willow.*—This species is officinal in the Prussian Pharmacopœia, and is preferred by Nees von Esenbeck to all other species. Its bark is the *cortex salicis laureæ* of some pharmacologists.

6. *Salix purpu'rea*, Linn.; *Bitter Purple Willow.*—This species deserves notice on account of the intense bitterness of its bark.

Description.—Willow bark (*cortex salicis*) varies, in its appearance and qualities, according to the species and the age of the tree from which it is procured. In the dried state, it is usually quilled and odourless. It should have a bitter and astringent taste.

Composition.—The bark of *Salix alba* was analyzed by MM. Pelletier and Caventou (*Journ. de Pharm.* t. vii. p. 123), who obtained the following results:—*Bitter yellow colouring matter*, *green fatty matter*, similar to that found in cinchona, *tannin*, *resinous extract*, *gum*, *wax*, *woody fibre*, and a *magnesian salt*, containing an organic acid.

These celebrated chemists failed to isolate *salicin*, which must have been contained in their bitter yellow colouring matter, either mixed or combined with some other matter. Their resinous extract is probably identical with what Braconnot calls *corticin*.

1. *Tannic acid.*—This is the astringent principle of willow bark. Sir H Davy (*Elem. of Agricult. Chem.* p. 83, 4th ed.) gives the following as the quantities of tannin [impure tannic acid], in the bark of two willows:—

480 lbs. of bark.	lbs. of tannin.
Leicestershire Willow [*Salix Russelliana*] large size	33
Common Willow .... [*Salix* —— ?].... large	11

2. *Salicin.*—A crystallizable, non-nitrogenous principle, obtained from several species of salix. Probably contained in all those whose barks possess bitterness, but the quantity varies with the species, the soil, age of the tree, and perhaps the season. It is white, very bitter, inodorous, fusible at 212°, much more soluble in boiling than in cold water, soluble in alcohol, but not so in ether or the volatile oils. Composed, according to Pelouze and Gay-Lussac, of $C^2 H^2 O^1$. Herberger considers it to be a saline compound of a vegetable alkali (*salicina*), and an odorous, volatile acid. Sulphuric acid dissolves and reddens it: the red solution attracts water from the air, and deposits a red powder (*rutilin* of Braconnot). Salicin possesses tonic properties analogous to those of sulphate of quina. It is not so liable to irritate the stomach as the latter. It may be employed in dyspepsia, intermittents, and other diseases for which sulphate of quina is usually given. The dose is from 10 to 30 grains. Bally has administered 200 grains in 24 hours. Salicin may be given in powder, mixed with sugar, or dissolved in some aromatic water (Blom, *Med. Beobacht. u. Beitr. ü die Salicine*, Potsdam 1835).

Chemical Characteristics.—A decoction of the bark, made with distilled water, is coloured dark green (*tannate of iron*) by sesquichloride of iron; but, made with spring water, dark purple. Solution of gelatin produces a precipitate (*tannate of gelatin*) in the decoction; but tincture of nutgalls causes no turbidness. A strong decoction of willow bark, containing much salicin, is reddened by concentrated sulphuric acid.

Physiological Effects.—Willow bark possesses both bitterness and astringency. It belongs, therefore, to the *astringent-tonics*, whose effects have been already noticed (p. 80). It is less apt to disturb the stomach than cinchona, but its tonic and febrifuge powers are less than the latter. Vogt (*Pharmakodynamik*, Bd. 1. S. 658) ascribes to it balsamic properties.

Uses.—It has been employed as an indigenous substitute for cinchona. The indications for its use, therefore, are the same as those for the latter. It is given in intermittents, dyspeptic complaints accompanied with or dependent on a debilitated condition of the digestive organs, passive hemorrhages, chronic mucous discharges, in the stage of convalescence after fever, and as an anthelmintic. As a local astringent, the powder or infusion is sometimes employed; but there are many more efficient remedies of this kind.

ADMINISTRATION.—The dose of the *powder* is ʒss. to ʒi. The *infusion* or *decoction* (prepared with ℥i. of the bark, and Oj. of water) may be given in doses of from f℥i. to f℥iii.

ORDER 24. CUPULIF'ERÆ, *Richard.*—THE OAK TRIBE.

CORYLACÆ, *Mirbel.*

ESSENTIAL CHARACTER.—*Flowers* unisexual; males, amentaceous; females, aggregate or amentaceous. *Males:*—*Stamens* five to twenty, inserted into the base of the scales, or of a membranous calyx, generally distinct. *Females:*—*Ovaries* crowned by the rudiments of a superior calyx, seated within a coriaceous involucre (*cupule*) of various figure, and with several cells and several ovules, the greatest part of which are abortive; *ovules* twin or solitary, pendulous; *stigmas* several, subsessile, distinct. *Fruit* a bony or coriaceous, one-celled nut, more or less inclosed in the involucre. *Seeds* solitary, one, two, or three, pendulous; *embryo* large, with plano-convex, fleshy cotyledons, and a minute superior radicle. *Trees* or *shrubs*. *Leaves* with stipules, alternate, simple, often with veins proceeding straight from the midrib to the margin (*Lindley*).

PROPERTIES.—The prevailing quality of this order is astringency, owing to the presence of tannic acid.

Quer'cus peduncula'ta, Willd. L. E.—*The Common British Oak.*

Quercus Robur, *Linn. D.*

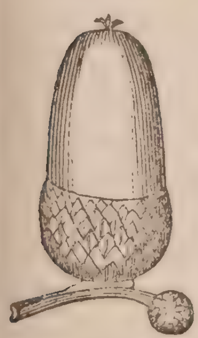
Sex. Syst. Monœcia, Polyandria.

(Cortèx, *L. D.* The Bark, *E.*)

HISTORY.—The oaks (*Quercus* of botanists) were held sacred by the Greeks, Romans, Gauls, and Britons. They are mentioned in the Old Testament (*Isaiah*, ch. i. v. 29, 30). Both Dioscorides and Galen were acquainted with their astringent qualities. "Every part of the oak," says Dioscorides (lib. i. cap. 142), "but especially the liber, possesses an astringent property."

BOTANY.—*GEN. CHAR.* Monœcious. *Male flowers:*—*Catkins* lax and pendulous. *Perianth* lacerated. *Stamens* five to ten. *Female flowers:*—*Involucre* scaly; the *scales* numerous, imbricated; combined with a coriaceous, hemispherical cup. *Perianth* six-lobed, adnate to the ovary. *Ovary* three-celled; two of the cells abortive. *Stigmas* three. *Nut* (*glans* or *acorn*) one-celled, one-seeded, surrounded at the base by the cupule (*acorn-cup*) (*Bot. Gall.*)

FIG. 145.



The Acorn.

SP. CHAR.—*Leaves* deciduous, shortly-stalked, oblong-obovate, deeply sinuate; their sinuses rather acute, lobes obtuse. *Fruits* two to three upon a long peduncle (*Hooker*).

A large and handsome *tree*, remarkable for its longevity. *Twigs* round, smooth, grayish-brown. *Leaves* bright green, furnished with a single midrib sending off veins into the lobes. *Male flowers* yellowish; *females* greenish, tinged with brown.

HAB.—Indigenous, growing in woods and hedges. Flowers in April. It is found in most European countries.

BARKING.—In the spring, the barks of trees contain more astringent matter, and are more readily separated from the wood. The usual time for barking the oak is from the beginning of May to the middle of July. The barkers make a longitudinal incision with a mallet furnished with a sharp edge, and a circular incision by means of a barking bill. The bark is then removed by the peeling-irons, the separation being promoted, when necessary, by beating the bark with the square end of the mallet. It is then carefully dried in the air, by setting it on what are called lofts or ranges, and is afterwards stacked (*Loudon's Encyclop. of Agricult.*, 3rd ed. p. 658, 9).

Description.—Oak bark (*cortex quercûs*) consists of pieces of from one to two feet long, which vary in their appearance according to the age of the stem or branch from which they have been taken. The bark of young stems is thin, moderately smooth, covered externally with a silvery or ash-gray cuticle, and is frequently beset with lichens. Internally it is, in the fresh state, whitish; but, when dried, brownish, rough, and fibrous. The bark of old stems is thick, very rough externally, cracked, and wrinkled, and is of inferior quality.

Composition.—According to Braconnot (*Ann. de Chim. et de Phys.* t. 50, p. 381), oak bark contains—*Tannic acid, tannates of lime, magnesia, potash*, &c., *gallic acid, uncrystallizable sugar, pectin*, and *lignin*.

1. *Tannic acid.*—The quantity of tannin [impure tannic acid] obtained by Davy (*Elem. of Agricult. Chem.* p. 83, 4th ed.) from oak bark is as follows:—

480 lbs. of	Tannin afforded.
Entire bark of middle-sized oak, cut in spring	29 lbs.
,, coppice oak	32
,, oak cut in autumn	21
White interior cortical layers of oak bark	72

Biggins (Pfaff, *Syst. d. Mat. Med.* Bd. ii. S. 207) obtained 30 parts of tannin from the bark of an oak felled in winter, while the same weight of the bark of an oak felled in spring yielded him 108 parts.

2. *Gallic acid.*—This contributes to the astringency of oak bark. It is formed probably by the action of the air on the tannic acid.

Chemical Characteristics.—Decoction of oak bark reddens litmus, and becomes dark blue or purple (*tannate of iron*) on the addition of sesquichloride of iron. A solution of gelatin causes a precipitate (*tannate of gelatin*) with it. It is somewhat remarkable, however, that a solution of emetic tartar causes no precipitate with the decoction. [If alcohol be added to the decoction, concentrated to the consistence of a syrup, it causes the precipitation of *pectin*. A decoction, rendered alkaline by a fixed alkali, deposits a gelatinous matter (*pectic acid*) on the addition of acetic acid. *Braconnot.*]

Physiological Effects.—The effects of oak bark are similar to those of other vegetable astringents containing tannic acid, and have been already described (pp. 79, 80).

Uses.—The principal value of oak bark, in medicine, arises from its astringent property. Thus we employ a decoction of it as a gargle in relaxed conditions of the uvula, and in chronic inflammatory affections of the throat (Cullen, *Mat. Med.* vol. ii. p. 45); as a wash, in flabby, ill-conditioned, or bleeding ulcers; as an injection in leucorrhœa, in piles, and in prolapsus of the uterus or rectum; as an internal astringent in old diarrhœas, in the last stage of dysentery, in alvine hæmorrhages, &c. Poultices made of powdered oak bark have been applied with benefit to mortified parts (Barton, *Collect. towards a Mat. Med. of the U. States*). Mr. Lizars (*Ed. Med. and Surg. Journ.*, July 1822) states that he has obtained "wonderful success" in the cure of reducible herniæ by bathing the groin (the hernia having been previously reduced) three or four times daily with a warm inspissated decoction of oak bark, and then applying a truss. The practice, however, is not a new one (See the references in Ploucquet's *Literatura Medica*, t. ii. p. 297.)

The inhalation of finely-powdered oak bark is said to have proved very beneficial in a supposed case of pulmonary consumption (Eberle, *Treat. on Mat. Med.* vol. i. p. 268, 2nd ed.) I have already noticed (p. 51) the inspiration of impalpable powders of other astringents as a remedy for phthisis. Connected with this, the popular opinion of the exemption of operative tanners from phthisis pulmonalis deserves to be mentioned. Dr. Dods (*Lond. Med. Gaz.* vol. iii. p. 497), who has paid some attention to this subject, concludes, that the popular notion is correct; and he ascribes the exemption to "the inhalation of that peculiar aroma, or volatile matter, which is constantly arising from tan-pits during the process of tanning with bark." Hitherto, however, no sufficient evidence has been advanced to prove that tanners are exempt from the disease.

As a tonic, oak bark has been employed in medicine, but it is much inferior to the cinchona. Baths made of a decoction of this substance have been used by Dr. Eberle in the intermittents of very young children with benefit; and Dr. Fletcher (of Virginia) has recommended the same remedy in tabes mesenterica (Eberle, *op. cit.* vol. i. pp. 267, 8.) The decoction, powder, and extract, have been taken internally in intermittents, but they are very apt to irritate the stomach. Dr. Cullen (*Mat. Med.* vol. i. p. 45) says, that both by itself and joined with chamomile flowers, he has prevented the paroxysms of intermittents.

ADMINISTRATION.—Dose of the *powder* from half a drachm to one or two drachms.

1. *DECOCTUM QUERCÛS*, L. E. D.—(Oak bark, bruised, ℨx. [℥i. *D.*]; Water [distilled, *L.*] Oii. Boil down to a pint, and strain). Used as a local astringent for various purposes, in the form of gargle, injection, or lotion. Administered internally in doses of f℥ii. to f℥iv. Sometimes employed as a bath, especially for children.

2. *EXTRACTUM QUERCÛS*, D.—(Obtained by evaporating a decoction). Rarely employed in medicine. May be given internally as an astringent, in the dose of from ten grains to a drachm.

Quer'cus infecto'ria, Olivier, L. E. D.—*The Gall* or *Dyers' Oak.*

Sex. Syst. Monœcia, Polyandria.

(Gallæ; Gemmæ morbidæ, *L.* Gallæ; Excrescences, *E.* Gallæ, *D.*)

HISTORY.—Hippocrates employed the nutgall (κηκὶς) as an astringent, both internally and externally (*ed. Fœs.* pp. 609, 267, &c.) Dioscorides lib. i. cap. 146) describes it as the fruit of the oak; and the same error is found in the works of comparatively recent writers, as of Pomet (*Hist. of Drugs*, Engl. Transl. 1712). Mr. Lambert (*Trans. of the Linn. Soc.* vol. xvii. p. 445) declares the celebrated *Mad Apples* (*Mala insana* seu *Poma Sodomitica*) to be galls of the *Quercus infectoria*; but he is certainly in error when he says they "are identical with those of commerce." His drawing of them disproves this statement.

BOTANY.—*GEN. CHAR.* Vide *Quercus pedunculata.*

Sp. Char.—*Leaves* ovate-oblong, sinuate-dentate, very smooth, deciduous. *Fruit* sessile, very long (Olivier, *Voy. dans l'Empire Ottom.* t. ii. p. 64).

Small tree or *shrub*, from four to six feet high. *Stem* crooked. *Leaves* on short petioles, with a few short mucronate teeth on each side. *Acorn* two or three times as long as the cupule.

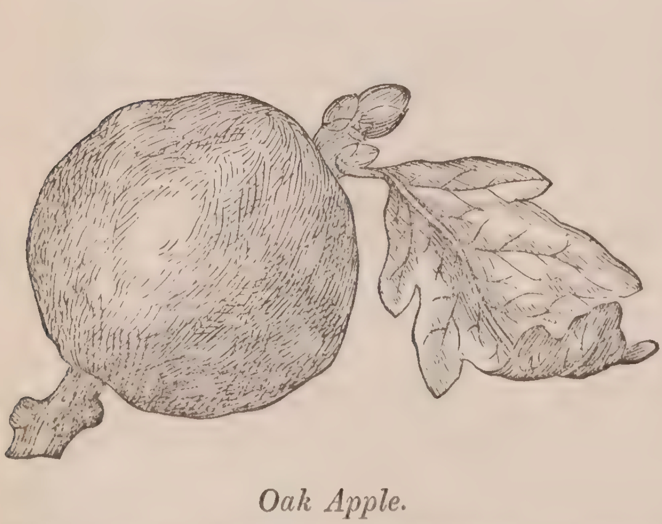
Hab.—Asia Minor, from the Bosphorus to Syria, and from the Archipelago to the frontiers of Persia.

Formation of Nutgalls.—The Hymenopterous insects of the tribe called *Gallicolæ*, or *Diplolepariæ* (Cuvier, *Règne Animal*, t. v. p. 290), are furnished with a *terebra*, or borer, by means of which they are enabled to perforate the foliaceous or cortical parts of plants for the purpose of depositing their eggs, along with an acrid liquor, in the wound thus made. The irritation thereby produced gives rise to an influx of the juices of the plant to the wounded part, and an excrescence is formed, which is termed *a gall* (*galla*). Here the insect undergoes its transformations: the egg produces the larva (or maggot), which feeds on the juices of the plant, and is changed into the pupa. This afterwards becomes the perfect insect (*imago*), and, perforating the gall, escapes from its prison-house.

The external form and appearance of these productions are very constant when formed by the same insect, on the same part of the same plant; but the galls of different species of vegetables, as well those of the same species, produced by a different insect, vary considerably. There is reason for believing that the form and appearance of the gall is determined more by the insect than by the plant; for we sometimes have on the same oak two kinds of galls, of very dissimilar appearance, produced by different insects.

As familiar instances of galls, I may mention, first, the red carbuncular protuberances in the leaves of *Salix Helix*. The gall of the Sweet Briar or Eglantine (*Rosa rubiginosa*) is called *Bedeguar*, or the *Sweet Briar Sponge*, and will be noticed hereafter. Another well-known indigenous gall is the *Oak Apple*, produced on *Quercus pedunculata*. It is usually spheroidal, but of variable size; commonly, however, not exceeding one or two inches in diameter. Its texture is spongy. It has been employed, on account of the tannic acid which it contains, as a substitute for nutgalls in dyeing.

Fig. 146.



Oak Apple.

The gall of the *Quercus infectoria* is the *nutgall* of the shops. It is produced by the *Cynips Gallæ tinctoriæ* (vide Animalia). Olivier (*op. cit.*) says, that this insect lives on the Quercus infectoria only.

On the sides and at the ends of the branches and shoots of this tree, the female makes a puncture and deposits her egg. An excrescence is soon formed, within which the larva is developed, which is changed first into the pupa, and then into the imago. As soon as the perfect insect is produced, it eats its way out. If we examine those galls from which the animal has escaped, we observe externally a circular hole, of about a line in diameter, leading to a canal of from $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long, which passes to the centre of the gall. But in those galls in which the insect has not put off its pupa state, we find neither an external hole nor an internal canal. Those galls from which the insect has escaped are commonly larger, lighter coloured, and less astringent: they are termed *white galls.*

Commerce.—Nutgalls are imported principally from Turkey: hence their name of *Turkey Galls* (*Gallæ turcicæ*). They usually come from Constantinople, but sometimes from Smyrna. Those brought from Aleppo are the produce of Mosul (*Aleppo* or *Mosul Galls*), and are the best. *Smyrna Galls* are not so heavy, are lighter coloured, and contain a larger admixture of white galls than those brought from Aleppo. *East India Galls* are brought from Bombay. Ainslie (*Mat. Indica*, vol. i. p. 145) thinks, "that the greater part of the galls found in Indian bazars grow in Persia, and are brought to the peninsula by Arab merchants."

Description.—In commerce, three kinds of galls are distinguished, viz. *black* or *blue*, *green*, and *white*. But there is no essential distinction between the two first.

1. *Black* or *Blue Nutgalls* (*Gallæ nigræ* seu *cæruleæ*); *Green Nutgalls* (*Gallæ virides*).—These are gathered before the insect has escaped, and are called by the natives *Yerli*. They vary from the size of a pea to that of a hazel-nut, and have a grayish colour. The smallest have a blackish-blue tint, and are distinguished by the name of *black* or *blue galls*, while the larger and greener varieties are called *green galls*. Externally they are frequently tuberculated, but the surface of the tubercles and of the intervening spaces is usually smooth. Their texture is compact, but fragile. They have no odour, but a styptic and powerfully astringent taste.

2. *White Galls* (*Gallæ albæ*).—These are for the most part gathered after the insect has escaped, and hence they are perforated with a circular hole. They are larger, lighter coloured (being yellowish or whitish), less compact, less heavy, and less astringent. They are of inferior value.

Composition.—Nutgalls were analyzed by Sir H. Davy (*Phil. Trans.* 1803), who obtained the following results:—

Matters soluble in water=37; viz.	Tannin	26·0
	Gallic acid, with a little extractive	6·2
	Mucilage and matters rendered insoluble by evaporation	2·4
	Carbonate of lime and saline matter	2·4
Matter insoluble in water (*lignin*)		63·0
Good Aleppo Nutgalls		100·0

1. *Tannic acid* (*Acidum Tannicum*).—The substance formerly described in chemical works by the name of *tannin*, is tannic acid mixed with some foreign matters, from which it is very difficult to free it.

When extracted from nutgalls by ether, in the percolation or displacement apparatus (*appareil à déplacement*) as recommended by Pelouze (*Ann. de Chim. et de Phys.* liv.), this acid presents itself as a non-crystalline, white solid, sometimes having a yellowish tinge. 100 parts of nutgalls yield from 35 to 40 parts of tannic acid.

The following are the essential characteristics of this substance:—It has an intensely astringent taste, and produces, with a solution of gelatin, a white precipitate (*tannate of gelatin*); with a solution of a sesquisalt of iron, a deep blue compound (*tannate of iron*);

and with solutions of the vegetable alkalies, white precipitates (*tannates*), slightly soluble in water, but very soluble in acetic acid. The mineral acids also cause precipitates with concentrated solutions of tannic acid, as do the alkalies and their carbonates. Gelatinous alumina rapidly absorbs tannic acid from its solution, and forms an insoluble compound with it.

Tannic acid is composed of $C^{18} H^8 O^{12}$; consequently its equivalent or atomic weight is 212.

Tannic acid is a very powerful astringent. Given to dogs to the extent of 12 grains it caused constipation. One of the animals being killed, the intestinal mucous membrane was found dry, and the fæcal matter hard, and collected in the colon. In doses of two grains and a half it produced constipation in the human subject (Cavarra, *Lond. Med. Gaz.* vol. xx. p. 171). To the presence of this acid the vegetable astringents principally owe their medicinal activity (vide p. 81). It has been employed in hemorrhages (from the lungs, uterus, and rectum), and in profuse mucous discharges (diarrhœa, pulmonary catarrh, leucorrhœa, and gonorrhœa). It may be administered in doses of three grains, in the form of pill or solution. It presents but few advantages over the astringent extracts.

2. *Gallic Acid* (*Acidum Gallicum.*)—Though we obtain nearly 20 per cent. of gallic acid from nutgalls, these excrescences contain very little of it, our produce being principally the result of the decomposition of the tannic acid. Nay, Pelouze thinks that even the small quantity of gallic acid which does exist in nutgalls, is formed by the action of the air on the tannic acid during or subsequent to the process of drying these bodies.

The conversion of tannic into gallic acid is effected by the agency of the air, the oxygen of which is absorbed, while an equal volume of carbonic acid is evolved. Two atoms of tannic acid absorb thirty atoms of oxygen from the air, and yield 3 atoms gallic acid, 15 atoms carbonic acid, and 9 atoms water.

	Carb. atms.	*Hyd.* atms.	*Oxyg.* atms.
2 atoms Tannic acid consist of	36	18	24
30 atoms Oxygen of the air ..	0	0	30
Total	36	18	54

	Carb. atms.	*Hyd.* atms.	*Oxyg.* atms.
3 atoms Gallic acid consist of ..	21	9	15
15 atoms Carbonic acid..........	15	0	30
9 atoms Water..................	0	9	9
Total	36	18	54

When the air is excluded no gallic acid is formed.

Pure gallic acid is a colourless, crystallizable solid, with an acidulous and styptic taste. It produces a deep blue colour with the sesquisalts of iron, in which circumstance it agrees with tannic acid; but it differs from the latter acid in not precipitating gelatin or the vegetable alkaline salts. To detect gallic acid mixed with tannic acid, the latter is to be previously removed from its solution by immersing in it a piece of skin depilated by lime. The tannic acid is absorbed. The gallic acid may then be detected by the salts of iron.

Gallic acid consists of $C^7 H^3 O^5$; hence its equivalent or atomic weight is 85. When heated to 410° or 420° F., it gives out carbonic acid, and is resolved into *pyrogallic acid* ($C^6 H^3 O^3$). If the heat be raised to 480° F., both water and carbonic acid are evolved, and *metagallic acid* ($C^{12} H^3 O^3$) is produced.

The effects and uses of gallic acid have been before noticed (p. 81).

3. *Ellagic acid* (*Acidum Ellagicum*). — Discovered by Braconnot, who named it ellagic acid, from the French word for galls (*galle*) spelt backwards. It is obtained from galls in the process for making gallic acid, and hence is probably a product, and not an educt. It is a white, insipid powder, which becomes of a blood-red colour on the addition of nitric acid. It consists of $C^7 H^2 O^4$; hence its equivalent or atomic weight is 76.

Chemical Characteristics. — Infusion of nutgalls reddens litmus paper, forms an inky compound (*tanno-gallate of iron*) on the addition of a sesquisalt of iron, and a yellowish white precipitate (*tannate of gelatin*) with a solution of gelatin. If a piece of skin, depilated by lime, be immersed in the infusion, and agitated with it from time to time, all the tannic acid is absorbed, the filtered liquid striking a blue colour (*gallate of iron*) with the sesquisalts of iron, but gives no precipitate with a solution of gelatin. Infusion of galls forms precipitates (*metallic tannates* or *tanno-gallates*) in many metallic solutions (see the table given in Mr. Brande's *Manual of Chemistry*, p. 930, 4th ed.)

PHYSIOLOGICAL EFFECTS.—As nutgalls contain a larger portion of tannic acid than any other known vegetable production, they possess in the highest degree the properties of an astringent (vide p. 79).

USES.—The following are the principal uses of nutgalls:—

1. *As a tonic in intermittents.*—Notwithstanding Poupart's favourable report of the use of galls in these cases, they scarcely deserve notice, as we have in arsenic, cinchona, and sulphate of quina, much more effective and certain febrifuges.

2. *As an astringent in hemorrhages*, especially passive alvine hemorrhage.

3. *In chronic mucous discharges*, as old diarrhœas.

4. *As a chemical antidote.*—Nutgalls may be given in poisoning by ipecacuanha, emetina, the organic alkalies generally, and those vegetable productions whose activity depends on an organic alkali, as opium, white hellebore, colchicum, nux vomica, &c. Their efficacy arises from the tannic acid, which combines with the vegetable alkali to form a tannate possessing less activity than the other salts of these bases; perhaps because of its slight solubility. Nutgalls are recommended as an antidote in cases of poisoning by emetic tartar, but I very much doubt their efficacy (see p. 420).

5. *As a topical astringent.*—Nutgalls are applicable in any cases requiring the topical use of a powerful vegetable astringent. Thus, in the form of gargle, in relaxation of the uvula; as an injection, in gleet and leucorrhœa; as a wash, in flabby ulcers, with profuse discharge; prolapsus ani seu vaginæ; in the form of ointment, in piles, &c.

ADMINISTRATION.—The dose of the *powder* is from ten to twenty grains. The *infusion* is prepared with four drachms of nutgalls and six ounces of water: the dose is from f℥ss. to f℥ii.; or, in cases of poisoning by the vegetable alkalies, f℥iv.

Besides the following officinal formulæ for the use of galls, others have been published by Mouchon (*Gaz. des Hôp. Civ. et Milit.* 13 Avril 1837).

1. *TINCTURA GALLÆ*, L.; *Tinctura Gallarum*, E. D.—(Galls, bruised, ℥v. [℥ij. *E.*, ℥iv. *D.*]; Proof Spirit, Oij. [Oj. *E.*, Oij. (Wine measure) *D.*] Macerate for fourteen [seven, *D.*] days, and filter. "This tincture may be prepared either by digestion or percolation, as directed for tincture of capsicum," E. D.) A powerful astringent. Dose from fʒss. to fʒij. Diluted with water, it forms a very useful and convenient astringent gargle and wash; but the principal use of this tincture is as a chemical test, especially for the salts of iron.

2. *UNGUENTUM GALLARUM*, D.—(Galls, in very fine powder, ℥i.; Lard, ℥iij. Mix them). Astringent. Mixed with zinc ointment it is applied to piles after the inflammatory stage is passed. The above is Dr. Cullen's formula; but Mr. B. Bell (*Syst. of Surgery*) recommends an ointment composed of equal parts of powdered galls, and hog's lard or butter, in external hemorrhoidal swellings.

3. *UNGUENTUM GALLÆ COMPOSITUM*, L.; *Unguentum Gallæ et Opii*, E. —(Galls, in very fine powder, ʒij.; Opium, powdered, ʒss. [ʒi. *E.*]; Lard, ℥ij. [℥i. *E.*] Mix.) An excellent astringent application to *blind*

piles (*i. e.* piles without hemorrhage) and prolapsus ani. The opium diminishes the pain which the galls might otherwise occasion, where the hemorrhoidal tumors are very sensible. From ʒss. to ʒi. of camphor is frequently added to this ointment.

Other Medicinal Cupuliferæ.

Quercus tinctoria, or the *Black Oak*, is a native of America. Its bark, called *quercitron*, is used by dyers. In the United States it is employed medicinally, but it is said to be disposed to irritate the bowels.

Quercus Suber, or the *Cork Oak*, is a native of the northern parts of Africa, and of the southern parts of Europe, particularly of France, Spain, and Portugal.

Fig. 147.

Quercus Suber.

Although no medicinal agent is obtained from it, yet the important pharmaceutical uses of its cortical portion must be my excuse for noticing it.

The substance, which we call *cork*, constitutes that part of the bark of the Quercus Suber which is commonly termed (in other trees) the *cellular envelope*, the *rete mucosum*, or *medulla externa*, and is originally situated between the cortical layers and the cuticle; but, owing to the drying and cracking of the latter, the cork forms usually the most external portion of the stem. This envelope falls naturally every eight or nine years, but for commercial purposes is usually removed one or two years before this period. That season of the year is selected when the bark adheres the most firmly to the wood, in order that the cork may be raised without endangering the separation of the liber from the alburnum. By this precaution, the trees are not at all injured by the corking process; nay, they are said to be more healthy and vigorous than when the cork is allowed to accumulate on their stems. The trees yield these crops from the age of 15 to 150 years.

To remove the cork, an incision is made from the top to the bottom of the tree, and a transverse circular incision at each extremity; the cork is then stripped off. To flatten it, a number of layers are piled up in a pit of water, and loaded with weights to keep them down. Subsequently they are dried, and in that state exported. Our supply is principally derived from Spain and Portugal. To close the transverse pores, cork is charred.

The physical properties of cork are too well known to need description. Its leading character is elasticity. In this respect it is similar to the wood of *Anona palustris*, called *cork wood*. When thin slices of cork are examined by the microscope, they present a cellular appearance.

When cork has been deprived of all its soluble matters by successive digestions in water and alcohol, it differs but little from ordinary cork; it is, however, then termed *Suberin*. This suberin is analogous in its nature to lignin; but, as it yields a peculiar substance (*suberic acid*, composed of $C^8\ H^6\ O^3$), when treated by nitric acid, it has been regarded as a distinct principle. Raspail contends that suberin is only lignin undeprived of some of its foreign matters, such as wax, resin, &c.

By distilling suberate of lime, Bossingault obtained an oleaginous substance, which has been denominated *suberone*.

The soluble principles of cork are *gallic acid*, some *gallates*, *resin*, a *waxy-like substance*, *colouring matter*, &c.; hence the impropriety of employing cork in closing vessels containing chalybeate liquids, as the iron is in part absorbed by the cork.

Cork was formerly employed in medicine. Reduced to powder, it was applied as a styptic: hung about the necks of nurses, it was thought to possess the power of stopping the secretion of milk; lastly, burnt cork, mixed with sugar of lead and lard, has been used as an application to piles.

The large capsules or acorn-cups of *Quercus Ægilops* are imported from the Levant, under the name of *Velonia*. They are employed by dyers.

On *Quercus coccifera* is found a little hemipterous insect, called *Kermes* (*Coccus Ilicis*). It was formerly used both in dyeing and medicine. But its use has been superseded by the cochineal.

In *Quercus falcata*, a peculiar substance, called *Quercia*, has been discovered. It is white and tasteless; combines with the mineral acids to form salts; and has a stronger analogy to the earths than to organic alkalies.

Order 24. Ulma'ceæ, *Mirbel*.—The Elm Tribe.

Essential Character.—*Flowers* hermaphrodite or polygamous, never in catkins. *Calyx* divided, campanulate, inferior, irregular. *Stamens* definite, inserted into the base of the calyx; erect in æstivation. *Ovary* superior, two-celled; *ovules* solitary, pendulous; *stigmas* two, distinct. *Fruit* one or two-celled, indehiscent, membranous, or drupaceous. *Seed* solitary, pendulous; *albumen* none, or in very small quantity; *embryo* straight or curved, with foliaceous cotyledons; *radicle* superior. *Trees* or *shrubs*, with scabrous, alternate, simple, deciduous leaves, and stipules (Lindley).

Properties.—Elm bark is tonic and astringent.

Ul'mus campes'tris, Linn. L. D.—*The Common small-leaved Elm.*

Sex. Syst. Pentandria, Digynia.
(Cortex, *L.* Cortex interior, *D.*)

History.—Dioscorides (lib. i. cap. 111) speaks of the astringent property of elm bark.

Botany. *Gen. Char.*—*Flowers* hermaphrodite. *Calyx* campanulate, four to five-toothed, coloured, persistent. *Stamen* three to six. *Ovary* compressed. *Stigmas* two. *Fruit* (a samara) suborbicular, with a broad membranous margin (*Bot. Gall.*)

Sp. Char.—*Leaves* doubly serrated, rough. *Flowers* nearly sessile, four-cleft. *Fruit* oblong, deeply cloven, naked. (Sir J. E. Smith.)

Fig. 148.

a, *Ulmus campestris*.
b, *Ulmus glabra*.

A large *tree*, with rugged *bark*. By the latter character it is readily distinguished from *Ulmus glabra*, which has a smooth, dark, lead-coloured bark.

Hab.—Southern parts of England. Flowers in March or April.

Description.—The officinal part of the elm is the inner cortical portion, or *liber*. To obtain it, the *bark* should be separated from the tree in spring; and, after the epidermis and a portion of the external cortex have been removed, the *liber* should be quickly dried.

As met with in the shops, the inner elm bark consists of thin, tough pieces, which are inodorous, and have a brownish-yellow colour, and a mucilaginous, bitter, very slightly astringent taste.

Composition.—According to Rinck (Geiger, *Handb. d. Pharm.*), 100 parts of elm bark contain:—*Resin* 0·63, *gum* and *mucus* 20·3, *impure gallic acid* (tannin ?) 6·5, *oxalate of lime* 6·3 (?), *chloride of sodium* (?) 4·6.

1. *Tannic acid.*—Davy (*Phil. Trans.* 1803, p. 233) states, that 480 grs. of elm bark yielded 13 grs. of tannin.

2. *Ulmic acid: Ulmin.*—On many trees, especially the elm, there is not unfrequently observed an exudation, which is supposed to be a morbid production. When dried it consists of a mucilaginous matter, and carbonate or acetate of potash. By the combined agency of the air and the carbonate, the organic matter is altered in its properties, and is converted into a brown substance, which combines with the potash. This brown matter has been termed *ulmin*, or *ulmic acid.* It may be formed artificially by a variety of processes, as by heating a mixture of wood and potash, by the action of sulphuric acid on vegetable matters, and by other methods. This acid is composed of $C_{30} H_{15} O_{15}$.

Chemical Characteristics.—Infusion of elm bark becomes green (*tannate of iron*) on the addition of a sesquisalt of iron, and forms a precipitate (*tannate of gelatin*) with a solution of gelatin.

Physiological Effects.—The effects of elm bark are those of a mild astringent tonic, containing a considerable quantity of mucilage, which gives it a demulcent property. Hence, in the classification of Richter (*Arzneimitt.* Bd. 1.) it is arranged as a *mucilaginous astringent.* The decoction, taken in full doses, accelerates the pulse, and acts as a diaphoretic and diuretic.

Uses.—Lysons (*Med. Trans.* vol. ii. p. 203) recommended the decoction of this bark in cutaneous eruptions; and Dr. Lettsom (*Med. Memoirs*, p. 152) found it successful in ichthyosis. It has now fallen almost into disuse.

Administration.—Used only in the form of decoction.

Decoctum Ulmi, L. D.—(Fresh Elm Bark, bruised, ℥ijss.; Distilled Water, Oij. Boil down to a pint, and strain). Formerly given in skin diseases, now fallen into disuse. Dose, f℥iv. to f℥vi. three or four times a day.

Other Medicinal Ulmaceæ.

Dr. M'Dowall, of Virginia, has proposed the bark of *Ulmus fulva* for bougies, tents, catheters, &c. (*Brit. and For. Med. Rev.* July 1838, art. *Elm Bark, Surgery*, p. 259).

Order 25. Urtica'ceæ, *Endlicher.*—The Nettle Tribe.

Urticeæ, *Jussieu.*

Essential Character.—*Flowers* small, greenish, monœcious or diœcious, solitary, amentaceous, or surrounded by a monophyllous involucrum. *Calyx* monosephalous, three to five-lobed, persistent. *Stamens* definite, inserted into the base of the calyx. *Ovary* simple, free; *styles* two or one, bifurcate. *Fruit* anachenium, surrounded by the persistent calyx, solitary, or inserted into the dilated fleshy receptacle. *Seeds* pendulous, with or without albumen. *Embryo* straight, curved, or spiral. *Radicle* generally superior. *Herbs* or *trees* usually with hispid and spathulate *leaves.* *Flowers* capitate or racemose (*Bot. Gall.*)

Properties.—Variable.

Hu'mulus Lu'pulus, Linn. L. E. D.—*The Common Hop.*

Sex. Syst. Diœcia, Pentandria.

(Strobili exsiccati, *L.* Catkin, *E.* Strobili siccati, *D.*)

History.—This plant is probably the *Lupus salictarius* of Pliny (*Hist. Nat.* lib. xxi. cap. 1, ed. Valp.) Its culture was introduced into this country from Flanders, in the reign of Henry VIII. (Beckmann, *Hist. of Invent.* vol. iv. p. 340).

BOTANY. *Gen. Char.—Diœcious. Males :—Calyx* five-partite. *Stamina* five. *Females :—Strobiles*, consisting of large, persistent, concave scales [bracts], having a single flower in the axilla of each. *Ovary* one. *Styles* two. *Seed* one, with an arillas. *Embryo* spirally contorted (*Bot. Gall.*)

FIG. 149.

Humulus Lupulus.

a, The male plant.
b, The female ditto.

Sp. Char.—The only species.

Perennial. Stems annual, long, weak, and climbing, scabrous. *Leaves* petiolate, three to five-lobed, serrated, veiny, rough. *Flowers greenish-yellow.*

Hab.—Thickets and hedges in many parts of Europe. Indigenous [?]. Flowers in July.

CULTIVATION.—The female plant is cultivated in several counties in England, especially Kent, Sussex, Surrey, Worcestershire, and Herefordshire. The third year after planting it generally comes into full bearing. *Stacking* or *setting the poles* is performed in April or May. The *gathering* or *picking* takes place in September. The cones are dried in kilns; and are then packed in hempen sacks called *bags* or *pockets*. This operation is called *bagging* (Loudon's *Encyclop. of Agricult.*)

DESCRIPTION.—The aggregate fruits of the Humulus Lupulus are strobiles or catkins (*strobili* seu *amenta lupuli*), in commerce termed *hops*. They consist of scales, nuts, and lupulinic glands or grains. The *scales* are the enlarged and persistent bracts, which enclose the nuts: they are ovate, membranous, and at their base glandular. The *nuts* (achenia) are small, hard, nearly globular, and covered with aromatic, superficial, globose glands. The *lupulinic glands* or *grains* (commonly termed *yellow powder* or *lupulin*) are the most important parts of the strobiles. By thrashing, rubbing, and sifting, Dr. Ives (*Journ. of Science*, vol. xi. p. 205) procured fourteen ounces from six pounds of hops; and he therefore concluded that dry hops would yield about a sixth part of their weight of these grains. They are usually intermixed with sand. When recently obtained from the living cone, the lupulinic grains are pyriform, and have a peduncle terminated by a *hilum*. Their structure is cellular. When dried (fig. 150) they are golden-yellow, somewhat transparent, flattened; and present, on some point of their surface, the mark (hilum) of their attachment to the organ which produced them (Raspail, *Chim. Organ.*) By immersion in ammonia or hydrochloric acid, they emit a vesicle or tube somewhat analogous to the tube emitted by grains of pollen during their explosion: this tube is formed at the expense of the internal cells, which are drawn out through the hilum.

FIG. 150.

Lupulinic grain, with its hilum (magnified).

COMPOSITION.—Payen, Chevallier, and Pelletan, (*Journ. de Pharm.* t. viii. p. 209; and *Journ. de Chim. Méd.* t. ii. p. 527) analyzed the scales and lupulinic grains. Dr. Ives (*Journ. of Sciences*, vol. xi. p. 205) also examined the latter.

Lupulinic Grains. Payen, Chevallier, and Pelletan's Analysis.		Ives's Analysis.		*Scales.* Payen, Chevallier, and Pelletan's Analysis.
Volatile oil	2·00	Tannin . .	4·16	Astringent matter.
Bitter principle (Lupulite)	10·30			Inert colouring matter.
Resin	50 to 55·00	Extractive .	8·33	Chlorophylle.
Lignin	32·00			Gum.
Fatty, astringent, and gummy matters, osmazome, malic and carbonic acids, several salts (malate of lime, acetate of ammonia, chloride of potassium, sulphate of potash) &c.	traces.	Bitter principle	9·16	Lignin.
		Wax . .	10·00	Salts (of potash, lime, and ammonia, containing acetic, hydrochloric, sulphuric, nitric, &c. acids).
		Resin . . .	30·00	The scales usually contain a portion of lupulinic matter, from which it is almost impossible to free them.
		Lignin . .	38·33	
	99·30		100·00	

1. *Volatile Oil of Hops.*—Resides in the lupulinic grains. Obtained by submitting these, or hops which contain them, to distillation with water. Its colour is yellowish, its odour that of hops, its taste acrid. It is soluble in water, but still more so in alcohol and ether. Its sp. gr. is 0·910. By keeping, it becomes resinified. It is said to act on the system as a narcotic. The water which comes over, in distillation, with the oil, contains acetate of ammonia, and blackens silver; from which circumstance the presence of sulphur is inferred.

2. *Bitter Principle of Hops: Lupulite; Lupuline.*—Is procured by treating the aqueous extract of the lupulinic grains, united with a little lime, with alcohol. The alcoholic tincture is to be evaporated to dryness, the residue treated with water, and the solution evaporated. The residue, when washed with ether, is lupulite. It is incrystallizable, yellowish-white, very bitter, soluble in 20 parts of water, very soluble in alcohol, and slightly so in ether. The aqueous solution froths by agitation; it forms no precipitate with either tincture of nutgalls or acetate of lead. Lupulite contains no nitrogen. It is devoid of the narcotic property of the oil. In small doses it is said to have caused loss of appetite and diminished digestive power; but a repetition of the experiment is very desirable.

3. *Resin.*—Is of a golden-yellow colour, and becomes orange-yellow by exposure to the air. It is soluble in both alcohol and ether. It appears to be the oil changed into resin, partly by oxidizement.

Chemical Characteristics.—A decoction of hops reddens litmus, owing to the presence of free acid. Sesquichloride of iron strikes an olive-green colour (*tannate of iron*). A solution of gelatin renders the filtered decoction turbid (*tannate of gelatin*). Chloride of barium occasions with it a white precipitate (*sulphate of baryta*). Oxalate of ammonia also causes a white precipitate (*oxalate of lime.*)

Physiological Effects.—The odorous emanations (vapour of the volatile oil) of hops possess narcotic properties. Hence a pillow of these cones promotes sleep, as I have several times witnessed. Moreover, we are told that stupor has occasionally been induced in persons who have remained for a considerable time in hop warehouses.

The lupulinic grains are aromatic and tonic. They appear also to possess soothing, tranquillizing, and, in a slight degree, sedative and soporific properties. But the existence of any narcotic quality has been strongly denied by Dr. Bigsby (*Lond. Med. Rep.* vol. iv. p. 287), Magendie (*Formulaire*), and others. "I have tried, at different times," says Magendie, "both the lupuline [lupulinic grains] in substance, and its different preparations, on animals, but I have never observed that it is a narcotic, although this property is one which is most strikingly displayed in experiments on animals." Dr. Maton (*Observations on Humulus Lupulus*, by A. Freake, 2nd ed.) found that it allayed pain, produced sleep, and reduced the frequency of the pulse from 96 to 60 in twenty-four hours.

Both infusion and tincture of hops are mild but agreeable aromatic tonics. They sometimes prove diuretic, or, when the skin is kept warm, sudorific. Their sedative, soporific, and anodyne properties, are very uncertain.

USES.—A pillow of hops (*cervicale*, *pulvinus*, seu *pulvinar lupuli*) is occasionally employed in mania, and other cases in which inquietude and restlessness prevail, and in which the use of opium is considered objectionable. In hop countries it is a popular remedy for want of sleep. The benefit said to have been obtained from it by George III., for whom it was prescribed by Dr. Willis, in 1787, brought it into more general use.

Hops are given internally to relieve restlessness consequent upon exhaustion and fatigue, and to induce sleep in the watchfulness of mania, and of other maladies; to calm nervous irritation; and to relieve pain in gout, arthritic rheumatism, and after accouchement. Though they sometimes produce the desired effect, they frequently fail to give relief. Dr. Maton used it, with good effect, as an anodyne in rheumatism.

As a tonic it is applicable in dyspepsia, cachectic conditions of the system, or any other maladies characterized by debility.

Hops have been applied, topically, in the form of fomentation or poultice, as a resolvent or discutient, in painful swellings and tumors. Freake employed an ointment, composed of lard and the powder of the hop, as an anodyne application to cancerous sores. (*Op. cit.* p. 13; see also *Annals of Medicine*, vol. ii. p. 403).

But the principal consumption of hops is in the manufacture of beer and ale, to which they communicate a pleasant, bitter, and aromatic flavour, and tonic properties, while, by their chemical influence, they check the acetous fermentation. Part of the soporific quality of beer and ale is ascribable to the hops used in the manufacture of these beverages.

ADMINISTRATION.—The best preparation of hops, for internal use, is the yellow powder (*lupulinic grains* or *lupulin*). The *infusion* and *tincture* are less eligible modes of exhibition. The *extract* is still more objectionable. *Well-hopped beer* is a convenient mode of administering hops, when fermented liquors are not contra-indicated.

1. *INFUSUM LUPULI*, L.—(Hops, ʒvj.; Boiling Distilled Water, Oj. Macerate for four hours, in a vessel lightly covered, and strain). Dose f℥j. to f℥ij.

2. *TINCTURA LUPULI*, L.; *Tinctura Humuli*, D.—(Hops, ℥vj. [℥v. *D.*]; Proof Spirit, Oij. Macerate for fourteen days, and strain). Dose fʒss. to fʒij.

3. *EXTRACTUM LUPULI*, L. E.; *Extractum Humuli*, D.—(Hops, lb. ss. [lb. j. *E.*]; Boiling Distilled Water, *Cong.* ij. [Cong. j. *E.*] Macerate for twenty-four hours, then boil down to a gallon, [Oiv. *E.*] and strain the liquor while hot; lastly, evaporate [in the vapour bath, *E.*] to a proper consistence. The directions of the Dublin are nearly the same

as those of the Edinburgh College). Dose, gr. v. to ℈j. Whatever virtue this preparation possesses is owing to the bitter principle or lupulite.

4. *Lupulina*: *yellow powder; Lupulinic grains* or *glands*.—(Separated from the strobiles by rubbing and sifting). Dose grs. vj. to grs. xii. taken in the form of powder or pills.

5. *Tinctura Lupulinæ; Tinctura Lupuli*, E.—(Take any convenient quantity of hops, recently dried; separate by friction and sifting the yellowish-brown powder attached to the scales. Then take of this powder one ounce, and of rectified spirit eight fluidounces; and prepare the tincture by percolation or digestion, as directed for tincture of capsicum. *Ph. Ed.*) Dose, ʒss. to ʒij.

Mo'rus ni'gra, Linn., L. D.—*The Common Mul'berry.*

Sex. Syst. Monœcia, Tetrandria.

(Fructus, *L.*, Baccæ, *D.*)

History.—The mulberry (*μορέα*) is mentioned by Hippocrates (*De victus ratione*, lib. ii. p. 360, ed. Fœs.) "Mora calfaciunt et humectant ac alvo secedunt," says the Father of Physic. Dioscorides (lib. i. cap. 180) also speaks of the mulberry.

Botany. *Gen. Char.*—Monœcious. *Catkins* unisexual. *Calyx* four-lobed; the lobes concave. *Stamens* four, alternate with the segments of the calyx. *Ovary* free. *Stigmas* two. *Seeds* one to two, covered by the pulpy calyx (*Bot. Gall.*)

Sp. Char.—*Leaves* cordate, ovate, lobed, or unequally dentate; rough and thickish. *Fruit* dark purple (*Bot. Gall.*)

Fig. 151.

Morus nigra.

A small *tree*, with rugged bark. *Flowers* greenish. "*Fruit*, consisting of the female flowers, become fleshy and grown together, inclosing a dry membranous pericarp" (Lindley.)

Hab.—Native of Persia and China. Cultivated for its fruit. Flowers in May.

Description.—The fruit is usually called *a berry* (*bacca mori nigræ*), but is, in fact, that kind called by botanists *a sorosis*. Its odour is peculiar and agreeable; its taste is peculiar, pleasant, acidulous, and sweet. The juice is dark violet red.

Composition.—The fruit has not been analyzed. Its principal constituents are *violet-red colouring matter, tartaric acid, sugar*, and *woody fibre*. The root has been analyzed by Wackenroder (Gmelin's *Handb. d. Chem.* 2, 1324).

Physiological Effects.—Mulberries are alimentary in a slight degree: they allay thirst, diminish febrile heat, and, in large quantities, prove laxative.

Use.—They are employed as an agreeable aliment, and are well adapted to check preternatural heat, and relieve thirst in fevers, but are objectionable when a tendency to diarrhœa exists. They owe their retention in the Pharmacopœia to their colour and flavour.

Syrupus Mori, L.—(Juice of mulberries, strained, Oj.; Sugar, Oijss. Dissolve the sugar in the mulberry juice with a gentle heat, and proceed in the same manner as directed for Syrup of Lemons). Used as a colouring and flavouring substance. Its acidity prevents its being used with alkalies, earths, or their carbonates.

Fi'cus Car'ica, Linn., L. E. D.—*The Common Fig.*

Sex. Syst. Polygamia, Triœcia, *Linn.*; Polygamia, Diœcia, *Willd.*; Diœcia, Triandria, *Pers.*

(Fici: fructus siccus, *L.*—Fici: the dried fruit, *E.*—Fructus siccatus, *D.*)

History.—In the Old Testament we are informed that Hezekiah (who lived 600 years before Christ) used figs as a topical application to a boil (*Isaiah*, ch. xxxviii. v. 21).

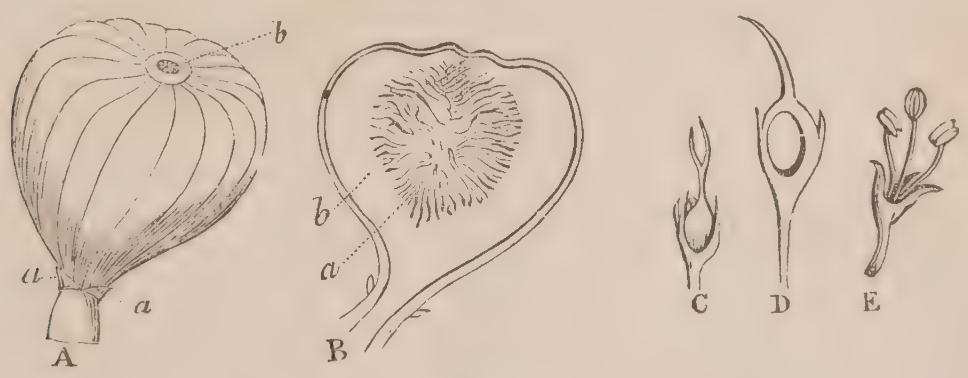
Fig. 152.

Ficus Carica.

Botany. *Gen. Char.* — Monœcious. *Flowers* numerous, pedicellated, inclosed within a fleshy receptacle, which is umbilicated, and nearly closed at the apex, hollow within. *Calyx* three to five-lobed: lobes acuminate. *Male-flowers* near the umbilicus. *Stamens* three to five. *Ovary* free (Desf.); semi-adnate (Gærtn.) *Style* one. *Stigmas* two. *Drupe* or *utricle* one-seeded, sunk in the pulpy receptacle. *Coat* of the nut fragile, crustaceous (*Bot. Gall.*)

Sp. Char.—*Leaves* cordate, palmate; scabrous above, pubescent beneath (*Bot. Gall.*) A small tree. Flowers in June. *Receptacle* green. At the base of each receptacle are two or three bracteal scales.

Fig. 153.



Ficus Carica.

A, Receptacle.
a a, bracteal scales.
b, umbilicus.
B, Longitudinal section of receptacle.
a, flowers seated on *b*, the inner side of the receptacle.
C, Female flower.
D, Section of ditto.
E, Male ditto.

Hab.—Native of Asia and south of Europe.

Description.—Figs (*fici seu caricæ*) constitute that kind of collective fruit called, by Mirbel, a *syconus*. They consist of fleshy, hollow, pyriform receptacles, within which are numerous, small, seed-like bodies (*achenia*, Lindley; *utricles*, Auctor). In the unripe state they contain an acrid and bitter juice, but which, when they are ripe, is replaced by sugar. Ripe figs are dried in the sun or in ovens, and are afterwards packed in drums and baskets, in which they are imported. As met with in the shops they are more or less compressed, are covered with a whitish, saccharine efflorescence, have a brownish or yellowish colour, and are somewhat translucent. They have a peculiar and agreeable odour, and contain a sweet, viscid pulp, in which is the achenia. *Turkey* or *Smyrna figs* are the largest, most juicy, and sweetest: hence they are sometimes termed *fat figs* (*caricæ pingues*): they are distinguished into *pulled* and *flat*. Of 20,406 *cwts.* of figs, imported in 1830, no less than 18,801 *cwts.* came from Turkey (*Parliam. Return.*)

Composition.—Bley (Zenker's *Naturgeschicte der vorzügl. Handelspfl.*) analyzed Smyrna figs, and obtained the following result:—*Sugar of figs* 62·5, *fatty matter* 0·9, *extractive with chloride of calcium* 0·4, *gum with phosphoric acid* 5·2, *woody fibre* and *seeds* [achenia] 150·0.

Physiological Effects.—Figs are nutritive, emollient, demulcent, and laxative. In the fresh state they are both agreeable and wholesome: when dried, as we receive them, they readily disorder the stomach and bowels, and occasion flatulence, griping, and mild diarrhœa.

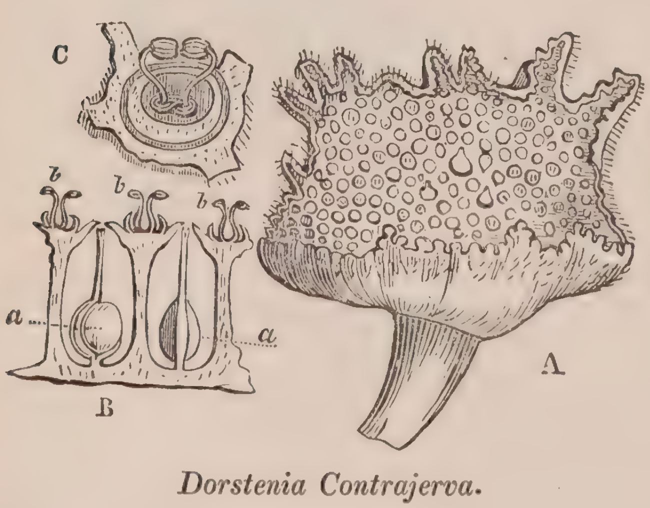
Uses.—In those countries where they are plentiful, figs are used as food. Here they are chiefly employed as a dessert. Internally they are given in the form of demulcent decoctions (as the *decoctum hordei compositum*, L. D.) in pulmonary and nephritic affections. As laxatives they are sometimes taken with the food, to relieve habitual constipation, and enter into the composition of *Confectio Sennæ*, L. (*Electuarium Sennæ*, E.) Roasted or boiled, and split open, they are employed as suppurative cataplasms in gum-boil, &c.

Dorsté'nia Contrajer'va, Linn. L.; and *D. brasilien'sis*, Lam.

Sex. Syst. Tetrandria, Monogynia.
(Dorstenia Contrajerva.—Radix, *L.*)

Botany. *Gen. Char.*—Monœcious. *Flowers* arranged upon a fleshy receptacle, usually flat and expanded, and extremely variable in form: *males* on the surface of the receptacle, two-lobed, fleshy, diandrous: *females* immersed in the receptacle, also two-lobed in most species. *Ovary* one to two-celled, with a single suspended ovule in each cell. *Style* one. *Stigma* two-lobed. *Achenia* lenticular, imbedded in the fleshy receptacle; from which they are projected with elasticity when ripe.—Dwarf *herbaceous* plants with scaly rhizomata (Lindley).

Fig. 154.



Dorstenia Contrajerva.
A, Entire receptacle.
B, Section of ditto.
a, Female flowers.
b, Male ditto.
C, Male flower in its superficial hollow.

Species. 1. *D. Contrajer'va*, Linn. L.—Caulescent; *stem* covered with spreading green, scaly stipules. *Leaves* palmate; the lobes lanceolate, acuminate, coarsely serrated and gashed, occasionally almost pinnatified. *Receptacle* on a very long stalk, quadrangular, wavy, or plaited (*Lindley*). A native of New Spain, Mexico, Peru, Tobago, St. Vincent's (*Willd.*) The root of this is not met with in commerce.

2. *D. brasiliensis*, Lam.—A native of Jamaica, Brazil, and Trinidad. This yields the contrayerva root usually met with in the shops.

Description.—The contrayerva root (*radix contrajervæ*), usually found in the shops, is imported from the Brazils. It consists of an ovoid or oblong rootstock, terminating, inferiorly, in one or several long, tapering, more or less curved, root-fibres. From the sides of the rootstock also arise numerous slender fibres. Externally the colour is yellowish-brown. The odour of the root is peculiar, but aromatic. The taste is warm, bitterish, slightly acrid.

I have also found another kind of contrayerva root in the shops. The rootstalk is smaller, cylindrical, blackish-brown, with fewer fibres. The receptacle and leaves are attached; the latter are reniform.

Composition.—The root has not been analyzed. It contains, according to Geiger (*Handb. d. Pharm.*) *volatile oil, bitter extractive*, and *starch*. To which may be added *resin, free acid*, and *woody fibre*.

Physiological Effects.—Stimulant, tonic, and diaphoretic. Its operation is very analogous to that of serpentary root, between which and the rhizome of the sweet flag it deserves to be arranged. The root of the *Dorstenia braziliensis* often proves emetic (Decandolle, *Essai sur les Propriétés Méd.*)

Uses.—Obsolete, or nearly so. It has been employed in fevers of a low type, and in other diseases requiring a mild, stimulant, and diaphoretic treatment.

Administration.—The dose of the root in *powder* is ℈j. or ʒss. The *infusion* (prepared by digesting from ʒiv. in f℥vj. of boiling water) may be given in doses of f℥j. or f℥ij. The *pulvis contrajervæ compositus* (composed of powdered contrayerva root ℥v. and prepared shells lb. iss.) is no longer officinal.

Other Medicinal or Poisonous Urticaceæ.

Antiaris toxicaria is the celebrated *Antsjar* or *Upas* poison tree of Java, rendered notorious principally in consequence of certain gross falsehoods stated concerning it, about the year 1780, by a person of the name of Foersch, said to have been a surgeon in the service of the Dutch East India Company. Malefactors, says this person, when they receive sentence of death, are offered the chance of life, if they will go to the Upas-tree for a box of poison; and although every precaution is taken to avoid the injurious influence of the emanations of the tree, yet of 700 criminals who went to collect the poison scarcely two out of twenty returned. Foersch further adds, that for fifteen or eighteen miles around this tree no living animal of any kind has ever been discovered. (See the translation of Foersch's paper in Burnett's *Outlines of Botany*, 552: also *Penny Magaz.* vol. ii. p. 321). Dr. Horsefield (*Quart. Journ.* vol. ii. p. 331) and M. Leschinault (*Ann. du Mus. d'Hist. Nat.* t. xvi. p. 476) have shewn that the above statements are for the most part fabulous. From their observations it appears that the *true poison tree* of Java is the *Antiaris toxicaria* (fig. 155, is taken from Blume's *Rumphia.*) (For a very elaborate account of this tree, by M. I. J. Bennett, see Dr. Horsefield's *Plantæ Javanicæ rariores*, p. 52).

Fig. 155.

Abor toxicaria. Ipo., Rumph. *Antiaris toxicaria,* Leschinault.

It is one of the largest forest trees of Java, being from 60 to 100 feet high. The milky juice is collected by incision, and is then inspissated by boiling along with the juice of arum, galanga, onions, &c. The poison, when brought to this country, is found to be a thick fluid, of a grayish-brown or fawn colour, and an unpleasant odour. It consists, according to Pelletier and Caventou, (*Ann. Chim et Phys.* t. xxvi. p. 44) of *a peculiar elastic resin, slightly soluble gummy matter analogous to bassorin*, and *a bitter matter soluble in alcohol and water.* This bitter matter is composed of *a colouring matter* absorbable by charcoal, *an undetermined acid*, and *anthiarin*, the active principle of the plant, and which is precipitable by tincture of galls. Sir B. Brodie (*Phil. Trans.* for 1811) says, the poison renders the heart insensible to the stimulus of the blood. Magendie and Delile (Orfila, *Toxicol. Gén.*) found that, besides acting on the brain and spinal marrow, it proved emetic. According to Andral, it causes convulsions with alternations of relaxation.

Fig. 156.

Artocarpus incisa.

Fig. 157.

A. integrifolia.

The *Artocar'pus inci'sa*, or *Bread-fruit tree*, and the *A. integrifo'lia* or *Jak fruit*, deserve notice on account of their important alimentary uses. *Artocarpus incisa* is a native of the islands of the Pacific and of the Moluccas. Its fruit is to the inhabitants of the Polynesia what corn is to the people of other parts of the world. *Artocarpus integrifolia* is cultivated throughout southern India, and all the warmer parts of Asia. Its

Fig. 158.

Cannabis sativa.

fruit forms a very considerable article of food in Ceylon. (For a full description of these plants, by Dr. Hooker, see *Botan. Magaz.* vol. ii. N. S.)

The *Cannabis sativa*, or *Hemp plant*, so well known for the tenacity of its fibres, possesses narcotic properties, and yields an intoxicating drug. A glandular secretion of this plant serves, among Asiatics, for both wine and opium. Dr. Royle (*Botany of the Himalayan Mount.* p. 334) suggests it may be the *Nepenthes* (νηπενθές) of Homer (*Odyssæ*, iv.)

Order 26. Pipera'ceæ, *Kunth.*—The Pepper Tribe.

Essential Character.—*Flowers* naked, hermaphrodite, with a bract on the outside. *Stamens* definite or indefinite, arranged on one side, or all round the ovary; to which they adhere more or less; *anthers* one or two-celled, with or without a fleshy connective; *pollen* smooth. *Ovary* superior, simple, one-celled, containing a single erect *ovule; stigma* sessile, simple, rather oblique. *Fruit* superior, somewhat fleshy, indehiscent, one-celled, one-seeded. *Seed* erect, with the embryo lying in a fleshy sac, placed at that end of the seed which is opposite the hilum, on the outside of the albumen. *Shrubs* or *herbaceous plants. Leaves* opposite, verticillate, or alternate, in consequence of the abortion of one of the pair of leaves, without *stipules. Flowers* usually sessile, sometimes pedicellate, in spikes which are either terminal or axillary; or opposite the leaves (Lindley).

Properties.—Fruits remarkable for their hot taste, and acrid and stimulant properties. These qualities they owe to the presence of an acrid oil and resin.

Pi'per ni'grum, Linn., L. E. D.—*The Black Pepper.*

Sex. Syst. Diandria, Trigynia.

(Baccæ, *L.* Dried unripe Berries, *E.* Semina, *D.*)

History.—The ancient Greeks were acquainted with pepper (πέπερι); their knowledge of which must have been derived, directly or indirectly, from the Hindoos. Hippocrates (*De morb. mul.* &c.) employed it in several diseases. Pliny (*Hist. Nat.* lib. xii. cap. 14, ed. Valp.) notices its uses as a condiment, and expresses his astonishment that it should have come into general use, since it has neither flavour nor appearance to recommend it.

Botany. *Gen. Char.*—*Spadix* covered with flowers on all sides. *Flowers* hermaphrodite, rarely diœcious, each supported by a scale. *Stamina* two or more. *Ovarium* with one, solitary, erect *ovule. Stigma* punctiform, obtuse, or split. *Berry* one-seeded. *Embryo* dicotyledonous [monocotyledonous, *Blume*], inverted (Blume, *Enum. Plant. Javæ*, p. 64).

Fig. 159.

Piper nigrum.

Sp. Char.—*Stem* shrubby, radicant, climbing, terete. *Leaves* ovate or elliptical, acuminate, occasionally somewhat oblique, subcordate, five to seven-nerved, coriaceous, smooth, recurved at the margin, glauco-greenish beneath. *Spadices* shortly pedunculated, pendulous. *Fruits* distinct (Blume, *op. cit.*)

Stem eight to twelve feet long, jointed, dichotomous. *Fruit* at first green, then red, afterwards black.

According to Dr. Roxburgh (*Fl. Indica*, vol. i. p. 153), *Piper trioicum* is cultivated, and yields excellent pepper.

Hab.—Cultivated in various parts of India and its islands (Roxburgh); also in the West Indies.

Preparation.—When any of the berries on a spadix change from green to red, the whole are considered fit for gathering; for if they are allowed to become fully ripe, they are somewhat less acrid, and, moreover, easily drop off. When collected they are spread out, and dried in the sun, and the stalks separated by hand-rubbing. They are afterwards winnowed (Marsden, *Hist. of Sumatra*, 3rd ed. p. 137). The dried and shrivelled berries constitute *black pepper* (*piper nigrum*).

White pepper (*piper album*) is prepared from the best and soundest grains, taken at their most perfect stage of maturity. These being soaked in water, swell, and burst their tegument, which is afterwards carefully separated, by drying in the sun, hand-rubbing, and winnowing (Marsden, *op. cit.*)

Commerce.—The pepper countries extend from about the longitude of 96° to that of 115° E., beyond which no pepper is to be found; and they reach from 5° S. latitude to about 12° N., where it again ceases. The following estimate of the production of pepper is drawn up by Mr. Crawford (M'Culloch, *Dict. of Comm.*)

Production of Pepper.	*lbs.*
Sumatra (west coast)	20,000,000
Do. (east do)	8,000,000
Islands in the Straits of Malacca	3,600,000
Malay peninsula	3,733,333
Borneo	2,666,667
Siam	8,000,000
Malabar	4,000,000
Total	50,000,000

In the year 1838, the number of pounds of pepper which paid duty (1*s.* per lb.) was 2,169,438. Pepper is usually imported in bags.

Description.—*Black pepper* is round, covered externally with a brownish-black, corrugated layer (the remains of the succulent portion of the berry), which may be readily removed by softening it in water. Internally we have a hard, whitish, spherical, smooth seed, which is horny externally, but farinaceous internally. The finest kind of black pepper is called *shot pepper*, from its density and hardness. *Fulton's decorticated pepper* is black pepper deprived of its husk by mechanical trituration.

It is sometimes bleached by chlorine (Brande, *Dict. of Mat. Med.*) The taste of pepper (both of nucleus and covering) is acrid and hot. White pepper is the fruit deprived of the external fleshy portion of the pericarp. The grains are larger than those of black pepper, spherical, whitish, and smooth, horny externally; internally they are farinaceous, or hollow in the centre. They are less acrid and pungent than black pepper.

COMPOSITION.—In 1819, Oersted discovered *piperin* in pepper. In 1821, black pepper was analyzed by Pelletier (*Ann. de Chim. et de Phys.* xvi. 344). In 1832, white pepper was analyzed by Lucä (Schwartze, *Pharm. Tab.*)

Black pepper (Pelletier).
Acrid soft resin.
Volatile oil.
Piperin.
Extractive.
Gum.
Bassorin.
Starch.
Malic acid.
Tartaric acid.
Potash, calcareous, and magnesian salts.
Woody fibre.

White pepper (Lucä).	
Acrid resin	16·60
Volatile oil	1·61
Extractive, gum, and salts	12·50
Starch	18·50
Albumen	2·50
Woody fibre	29·00
Water and loss	19·29
White pepper	100·00

Lucä found no *piperin* in white pepper; but Poutet (*Journ. de Pharm.* t. vii.) subsequently detected it. Probably, therefore, in Lucä's analysis, the piperin was contained in the resin.

1. *Resin of pepper (resina piperis)*.—This is a very acrid substance, soluble in alcohol and ether, but not so in the volatile oils. It possesses in high perfection the acrid properties of pepper. Dissolved in ether it was employed by Dr. Lucas, in intermittents, and in two out of three cases with success (Dierbach, *Neuest. Entd. in d. Mat. Med.* Bd. 1, S. 252, 1837).

2. *Volatile oil of pepper (oleum piperis)*.—When pure this is colourless; it has the odour and taste of pepper. Its sp. gr. is 0·9932 (Lucä). According to Meli (Dierbach, *op. cit.*), it possesses the same febrifuge properties as piperin, perhaps because it retains some of the latter principle. It has been used in some forms of dyspepsia depending on general debility.

3. *Piperin.*—This substance was discovered by Oersted in 1819, but was more accurately examined by Pelletier in 1821. It exists in black, white, and long pepper, and also in cubebs.

It is a crystalline substance, the crystals being rhombic prisms, with inclined bases. It fuses at 212° F., is insoluble in cold water, and is only very slightly soluble in boiling water. Its best solvent is alcohol; the solution throws down piperin when water is added to it. Ether dissolves it, but not so readily as alcohol. Acetic acid likewise is a solvent for it.

Piperin, when pure, is white; but, as met with in commerce, it is usually straw-yellow. It was at first supposed to be an alkali; but Pelletier has shewn that it possesses no analogy with vegetable alkalies, but that it is related to the resins. With strong sulphuric acid it forms a blood-red liquid. Nitric acid colours it first greenish-yellow, then orange, and afterwards red. The action of hydrochloric acid is similar.

It is composed of $C^{40}\ H^{22}\ N^{1}\ O^{8}$. Hence its equivalent or atomic weight is 340.

Piperin has been recommended and employed by Meli and several other physicians (Dierbach, *Neuest. Entd. in d. Mat. Med.* B. i. S. 176, 1828) as a febrifuge in intermittent fevers. It is said to be more certain and speedy, and also milder in its action, than the cinchona alkalies. Moreover, we are told it might be procured at a cheaper rate than sulphate of quinia. Its dose is about six or eight grains in powder or pills. Sixty grains have been taken in twenty-four hours, without causing any injurious effects. Meli considers two or three scruples sufficient to cure an intermittent. Magendie (*Formulaire*) proposes it in blennorrhagia, instead of cubebs.

Physiological Effects.—Pepper is one of the acrid spices whose general effects have been already noticed (p. 127). Its great acridity is recognized when we apply it to the tongue. On the skin it acts as a rubefacient and vesicant (Richard, *Dict. de Méd.* t. xvii. p. 307). Swallowed, it stimulates the stomach, creates a sensation of warmth in this viscus, and, when used in small doses, assists the digestive functions, but, if given in large quantities, induces an inflammatory condition. Thirty white pepper-corns, taken for a stomach complaint, induced violent burning pain, thirst, and accelerated pulse, which continued for three days, until the fruits were evacuated (Wibmer, *Arzneim. ü. Gifte*, Bd. iv. S. 220). Wendt, Lange, and Jager (quoted by Wibmer, *op. cit.* S. 119), have also reported cases in which inflammatory symptoms supervened after the use of pepper. On the vascular and secerning systems pepper acts as a stimulant. It accelerates the frequency of the pulse, promotes diaphoresis, and acts as an excitant to the mucous surfaces. On one of my patients (a lady) the copious use of pepper induces burning heat of skin, and a few spots of *Urticaria evanida* usually on the face. "I have seen," says Van Swieten (*Commentaries*, vol. v. p. 57, Eng. Transl.) "a most ardent and dangerous fever raised in a person who had swallowed a great quantity of beaten pepper." It has long been regarded as a stimulant for the urino-genital apparatus. The opinion is supported by the well-known influence of the peppers over certain morbid conditions of these organs. Moreover, the beneficial effect of pepper in some affections of the rectum leads us to suspect that this viscus is also beneficially influenced by these fruits.

Uses.—It is employed as a condiment, partly for its flavour, partly for its stimulant influence over the stomach, by which it assists digestion. As a gastric stimulant it is a useful addition to difficultly-digestible foods, as fatty and mucilaginous matters, especially in persons subject to stomach complaints from a torpid or atonic condition of this viscus. Infused in ardent spirit it is a popular remedy for preventing the return of the paroxysms of intermittent fevers, given shortly before the expected attack. The practice is not recent, for Celsus (lib. iii. cap. 12) advises warm water with pepper to relieve the cold fit. The febrifuge power of this spice has been fully proved, in numerous cases, by L. Frank (*Journ. Complém. du Dict. des Scienc. Méd.* t. viii. p. 371); Meli, *ibid.* t. xiii. p. 124) Riedmüller, (Dierbach), and others; though Schmitz (*Rust's Magaz.* Bd. xiv.) denies it. Barbier (*Traité Elém. de Mat. Méd.* 2d ed. t. ii. p. 57) says, that in some instances, where large doses were exhibited, death occurred in consequence of the aggravation of a pre-existent gastritis. It has been employed in gonorrhœa as a substitute for cubebs. In relaxed uvula, paralysis of the tongue, and other affections of the mouth or throat requiring the use of a powerful acrid, pepper may be employed as a masticatory. In the form of ointment it is used as an application to tinea capitis. Mixed with mustard it is employed to increase the acridity of sinapisms.

Administration.—The dose of black pepper (either of corns or powder) is from five to fifteen grains; the powder may be given in the form of pills.

1. *Confectio Piperis nigri*, L. D.; *Electuarium Piperis*, E.—(Black Pepper, Elecampane-root [Liquorice-root in powder, *E.*] aa. lb. j.; Fennel seeds, lb. iij.; Honey; White Sugar, aa. lb. ij. Rub the dry ingredients

together to a very fine powder. The *London College* keeps this in a covered vessel, and directs the Honey to be added when the Confection is to be used. But the *Edinburgh and Dublin Colleges* order the Honey to be added immediately after the dry ingredients have been mixed.) This preparation is intended to be a substitute for a quack medicine, called "*Ward's Paste*," which has obtained some celebrity as a remedy for fistulæ, piles, and ulcers about the rectum. Its efficacy doubtless depends on the gentle stimulus it gives to the affected parts. Sir B. Brodie (*Lectures* in *Lond. Med. Gaz.* vol. xv. p. 746) observes, that severe cases of piles are sometimes cured by it; and he thinks that it acts on them topically, the greater part of the paste passing into the colon, becoming blended with the fæces, and in this way coming in contact with the piles, on which it operates as a local application, much as *vinum opii* acts on the vessels of the conjunctiva in chronic ophthalmia. In confirmation of this view, he mentions the case of a patient attended by Sir Everard Home, who was cured by the introduction of the paste into the rectum. Confection of black pepper is adapted for weak and leucophlegmatic habits, and is objectionable where much irritation or inflammation is present. The dose of it is from one to two or three drachms twice or thrice a day. "It is of no use," says Sir B. Brodie, "to take this remedy for a week, a fortnight, or a month; it must be persevered in for two, three, or four months." As it is apt to accumulate in and distend the colon, gentle aperients should be exhibited occasionally during the time the patient is taking the confection.

2. *Unguentum Piperis nigri*, D.—(Prepared Hog's Lard, lb. i.; Black Pepper, reduced to powder, ℥iv. Make an ointment). Formerly in vogue for the cure of tinea capitis.

Pi'per long'um, Linn., L. E. D.—*The Long Pepper.*

Sex. Syst. Diandria, Trigynia.

(Fructus immaturus exsiccatus, *L.* Dried Spikes, *E.* Semina, *D.*)

Botany. *Gen. Char.*—Vide *Piper nigrum.*

Sp. Char.—*Stem* shrubby, climbing. Lower *leaves* ovate-cordate, three to five-nerved: upper ones on short petioles, oblong, acuminate, oblique, and somewhat cordate at the base, obsoletely four to five-nerved and veined, coriaceous, smooth, grayish-green beneath. *Peduncles* longer than the petiole. *Spadices* almost cylindrical (Blume, *Enum. Fl. Javæ*, p. 70).

Hab.—India. Found wild amongst bushes, on the banks of water-courses, up towards the Circar mountains. It flowers and bears fruit during the wet and cold seasons (Roxburgh). It is cultivated in Bengal, and in the valleys amongst the Circar mountains. The roots and thickest parts of the stems, when cut into small pieces and dried, form a considerable article of commerce all over India, under the name of *Pippula moola.*

Description.—When fully grown, but yet unripe, the spadices are gathered and dried by exposure to the sun. They are then packed in bags for sale.

As met with in commerce, *long pepper* is grayish-brown, cylindrical, an inch or more in length, having a mild aromatic odour, but a violent pungent taste.

Composition.—This pepper was analyzed by Dulong in 1825 (*Journ. de Pharm.* t. xi. p. 52). The following are the substances he obtained from it:—*Acrid fatty matter* (resin?), *volatile oil, piperin, nitrogenous extractive, gum, bassorin, starch, malates and other salts.*

The *volatile oil* of *long pepper* is colourless, and has a disagreeable odour and an acrid taste.

Physiological Effects and Uses.—The effects of long pepper are analogous to those of black pepper. Cullen (*Mat. Med.* vol. ii. p. 209) and Bergius (*Mat. Med.* Ed. 2nda, tom. i. p. 29) consider it less powerful; but most other pharmacologists are agreed on its being more acrid. Medicinally it may be employed in similar cases. It is used principally for culinary purposes. It is a constituent of several pharmacopœial preparations.

Pi'per Cube'ba, Linn. L. E. D.—*The Cubeb Pepper.*

Sex. Syst. Diandria, Trigynia.

(Baccæ; cubebæ, *L.* Fruit, *E.* Fructus, *D.*)

History.—It is uncertain when the cubebs of our shops were first introduced into medicine, or who first alludes to them. There does not appear to be any foundation for the opinion that the ancient Greeks were acquainted with them. "Many, indeed, pretend that the *Carpesion* (καρπήσιον) of Galen is our cubeb, and that the *round pepper* of Theophrastus, the *pepper* of Hippocrates, were all names for them; but this is a conjecture founded on a very bad basis. The Arabians are at the head of these blunders. Serapion has translated all that Galen says of carpesion into his chapter of cubeb, and attributed all its virtues to it, and has even added every thing to the account that Dioscorides has left us of the *Ruscus*. Avicenna is also in the same error, and calls the carpesium *cubeb*; and from these authors Actuarius and the other Greeks have collected their accounts. It is plain from all this, that either the carpesium of the Greeks and the cubebs of the Arabians are the same things, or else that the Arabians have been guilty of confounding different things in a strange manner together: if the latter be the case, there is no judging of any thing from what they say; and if the former, it is very evident that our cubebs are not the same with theirs—that is, with the carpesium of Galen; for he expressly assures us that this was not a fruit or seed, but, as he tells us, a kind of slender woody twigs, resembling in smell and virtues the root of the valerian. Nothing is more evident than that the carpesium, therefore, was either a fibrous root, or the small twigs and branches of a climbing plant, not a round small fruit. If the Arabians, therefore, were acquainted with our cubebs at all, it appears that, not knowing what the carpesium and ruscus were, they ignorantly attributed the virtues ascribed by the Greeks to these medicines to these fruits" (Hill, *Hist. of the Mat. Med.* p. 473).

Cubebs were in use in England 500 years ago, for, in 1305, Edward I. granted to the corporation of London the power of levying a toll of one farthing a pound on this article in its passage over London Bridge (*Liber Niger Scaccarii*, vol. i., p. *478. Also *The Chronicles of London Bridge*, p. 155).

Botany. *Gen. Char.*—Vide *Piper nigrum.*

Sp. Char.—*Stem* shrubby, terete, climbing. *Leaves* petiolate, oblong or ovate-oblong, acuminate, rounded or oblique cordate at the base, nerved, coriaceous, smooth. *Peduncles* almost equal to the petiole. *Berries* with elongated peduncles (Blume, *Enum. Fl. Javæ*, p. 70).

Dr. Blume says that the cubebs of the shops are the fruit of *P. caninum*, which has a smaller and shorter-stalked fruit, having a distinct anise flavour, and less pungency than the fruit of P. Cubeba; but Dr. Lindley (*Flora Medica*) observes, that he cannot perceive any difference in the flavour of the dried fruit of P. Cubeba and of the cubebs sold in the London shops. P. Cubeba is readily distinguishable from P. caninum by the leaves being coriaceous, smooth, and shining, with the veins proceeding from the side of the midrib, not from its base.

Hab.—Java and the Prince of Wales's Island.

Description.—The dried unripe fruit of this plant constitutes the *cubebs*, or *piper caudatum*, of the shops.

In appearance, cubebs resemble black pepper, except that they are lighter coloured, and are each furnished with a stalk two or three lines long, and from which circumstance they have received their name *caudatum*. The cortical portion of cubebs (that which constituted the fleshy portion of the fruit) appears to have been thinner and less succulent than in black pepper. Within, it is a hard spherical seed, which is whitish and oily. The taste of cubebs is acrid, peppery, and camphoraceous; the odour is peculiar and aromatic.

Composition.—Three analyses of cubebs have been made: one by Trommsdorf, in 1811 (Schwartz, *Pharm. Tabell.*); a second by Vauquelin, in 1820 (*Ann. Phil.*, 2nd Series, vol. iii. p. 202); and a third by Monheim, in 1835 (*Journ. de Pharm.* xx. 403).

Vauquelin.	*Monheim.*	
1. Volatile oil, nearly solid.	1. Green volatile oil	2·5
2. Resin like that of copaivá.	2. Yellow volatile oil	1·0
3. Another coloured resin.	3. Cubebin	4·5
4. A coloured gummy matter.	4. Balsamic resin	1·5
5. Extractive.	5. Wax	3·0
6. Saline matter.	6. Chloride of sodium	1·0
	7. Extractive	6·0
	8. Lignin	65·0
	Loss	15·5
Cubebs.	Cubebs	100·0

1. *Essential Oil of Cubebs* (*Oleum cubebæ*, E.)—By distillation, cubebs yield about 0·5 of a transparent, slightly-coloured, volatile oil, which is lighter than water, and has the cubeb odour, and a hot, aromatic, bitter taste.

By keeping, it sometimes deposits crystals (*Cubeb stearoptene* or *Cubeb camphor*), the the primary form of which is the rhombic octahedron. Their odour is that of cubebs; their taste, at first, that of cubebs with camphor, afterwards cooling. They are fusible at 133° F. soluble in alcohol, ether, and oils, but are insoluble in water.

2. *Resin of Cubebs.*—Vauquelin has described two resins of cubebs: one is green, liquid, acrid, and analogous, both in odour and taste, to balsam of copaiva; the other is brown, solid, acrid, and insoluble in ether.

3. *Cubebin* (*Piperin*).—From cubebs is obtained a principle to which the term *cubebin* has been applied. It is very analogous to, if not identical with, piperin. Cassola, a Neapolitan chemist (*Journ. de Chim. Méd.* t. x. p. 685), says it is distinguished from the latter principle by the fine crimson colour which it produces with sulphuric acid, and which remains unaltered for twenty or twenty-four hours: moreover, Cubebin is not crystallizable.

Monheim (*op. cit.*) however declares Cubebin to be identical with piperin, and that it is combined with a soft acrid resin. In this state it is soluble in ether, alcohol, the fixed oils, and acetic acid; but is insoluble in oil of turpentine and dilute sulphuric acid. It fuses at 68° F.

Dr. Görres (Dierbach, *Neueste Entd. in d. Mat. Med.* S. 253, 1837) gave cubebin, in both acute and chronic gonorrhœa, to the extent of one drachm, four times daily. But he premised the use of phosphoric acid.

4. *Extractive matter of Cubebs.*—Vauquelin says the extractive matter of cubebs is analogous to that found in leguminous plants. It is precipitable by galls, but not by acetate of lead.

Physiological Effects.—Cubebs belong to the acrid spices, already (p. 72) noticed. Their sensible operation is very analogous to that of black pepper. Taken in moderate doses, they stimulate the stomach, augment the appetite, and promote the digestive process. In larger quantities, or taken when the stomach is in an irritated or inflammatory condition, they cause nausea, vomiting, burning pain, griping, and even purging. These are their local effects. The constitutional ones are those resulting from the operation of an excitant,—namely, increased frequency and fulness of pulse, thirst, and augmented heat. It probably stimulates all the mucous surfaces, but unequally so. In some instances, cubebs give rise to an eruption on the skin, like urticaria. Not unfrequently they cause headache; and occasionally disorder of the cerebro-spinal functions, manifested by convulsive movements or partial paralysis, as in a case related by Mr. Broughton (*London Med. Gaz.* vol. i. p. 405).

Cubebs appear to exercise a specific influence over the urino-genital apparatus. Thus they frequently act as diuretics, and at the same time deepen the colour of, and communicate a peculiar aromatic odour to, the urine. Their stimulant operation on the bladder is well illustrated by a case related by Sir Benjamin Brodie (*Ibid.* vol. i. p. 300). A gentleman, labouring under chronic inflammation of the bladder, took fifteen grains of cubebs, every eight hours, with much relief. Being anxious to expedite his cure, he, of his own accord, increased the dose to a drachm. This was followed by an aggravation of the symptoms: the irritation of bladder was much increased, the mucus was secreted in much larger quantity than before, and ultimately the patient died,—" his death being, I will not say occasioned," adds Sir Benjamin, " but certainly very much hastened, by his imprudence in overdosing himself with the cubebs."

Three drachms of cubebs caused in Pül (Wibmer, *Arzneim. ü. Giften*, Bd. iv. S. 217) nausea, acid eructations, heat at the pit of the stomach, headache, uneasiness, and fever.

Uses.—The principal use of cubebs is in the treatment of *gonorrhœa.* They should be given in as large doses as the stomach can bear, in the early stage of the disease; for experience has fully proved that in proportion to the length of time gonorrhœa has existed, the less amenable is it to the influence of cubebs. In some instances an immediate stop is put to the progress of the malady. In others, the violent symptoms only are palliated; while in many (according to my experience in most) cases no obvious influence over the disease is manifested. The presence of active inflammation of the urethra does not positively preclude the use of cubebs, though I have more than once seen them aggravate the symptoms. Mr. Jeffreys (*Observ. on the Use of Cubebs, or Java Pepper, in the cure of Gonorrhœa*, 1821) thinks the greatest success is met with in the more inflammatory forms of the disease. Cubebs have been charged with inducing swelled testicle; but I have not observed this affection to be more frequent after the use of cubebs than when they were not employed. Mr. Broughton (*Med.-Chir. Trans.* vol. xii. p. 99) gave them to fifty patients, and in forty-five they proved successful. Of these only two had swelled testicle. The explanation of the *methodus medendi* is unsatisfactory. Sir A. Cooper (*Lancet*, vol. iii. p. 201, 1824) thinks that cubebs produce a specific inflammation of their own on the urethra, which has the effect of superseding the gonorrhœal inflammation. The occasional occurrence of a cutaneous eruption from the use of cubebs deserves especial attention, as I have known it create a suspicion of secondary symptoms.

Cubebs have been recommended in gleet and leucorrhœa (Dr. Orr, *Ed. Med. Journ.* vol. xviii. p. 318). In abscess of the prostate gland, twenty or thirty grains of cubebs, taken three times a day, have in many cases appeared to do good (Sir B. Brodie, *Lond. Med. Gaz.* vol. i. p. 396). They seemed to give a gentle stimulus to the parts, and to influence the disease much in the same way that Ward's Paste operates on abscesses and fistulæ, and ulcers of the rectum. In cystirrhœa also they have occasionally proved serviceable in small doses (*Ibid.* p. 300). In piles, likewise, they are given with advantage (*Ibid.* vol. xv. 747).

Formerly cubebs were employed as gastric stimulants and carminatives in dyspepsia, arising from an atonic condition of the stomach. They have also been used in rheumatism. The Indians macerate them in wine, and take them to excite the sexual feelings.

Administration.—Cubebs, in the form of *powder*, are given in doses, varying from ten grains to three drachms. In affections of the bladder and prostate gland the dose is from ten grains to thirty grains. In gonorrhœa, on the other hand, they should be administered in large doses. Mr. Crawford (*Hist. of the Indian Archipelago*, vol. i. p. 465) says, that in Malay countries they are given in doses of three drachms, six or eight times during the day.

1. *Oleum Cubebæ*, E.; *Volatile Oil of Cubebs.*—(Prepared by grinding the fruit, and distilling with water). The physical properties of this oil have been already noticed. It is, in my opinion, the best and most convenient preparation of cubebs. The dose of it, at the commencement, is ten or twelve drops. This quantity is to be gradually increased as long as the stomach will bear it. In some instances, I have given it to the extent of a fluidrachm for a dose. It may be taken suspended in water by means of mucilage, or dropped on sugar. A combination of oil of cubebs and oil of copaiva forms a very useful medicine in some cases of gonorrhœa.

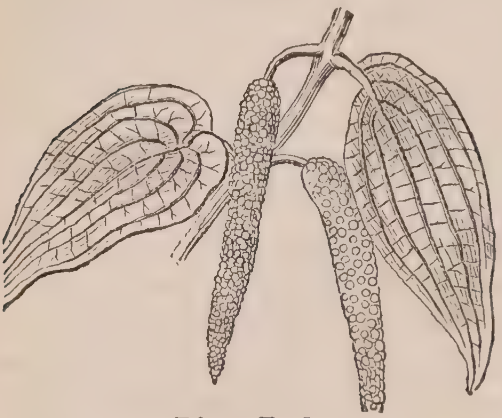
On the continent, a preparation, called the *oleo-resinous extract of cubebs*, is used. It is prepared by adding the oil to the resinous extract of cubebs, which is prepared by digesting the cake left after the distillation of the oil in alcohol, and distilling off the spirit (*Journ. de Pharm.* t. xiv. p. 40).

2. *Tinctura Cubebæ*, L.; *Tinctura Piperis Cubebæ*, D.—(Cubebs, ℥v. [℥iv. *D.*]; Rectified [Proof, *D.*] Spirit, Oij. [wine measure, *D.*] Macerate for fourteen days, and filter). Dr. Montgomery (*Observ. on the Dubl. Pharm.* p. 439, Lond.) says, "I have found this tincture cure gonorrhœa both speedily and satisfactorily." The dose of it is one or two drachms, three times a day.

Other non-officinal Piperaceæ.

The *Piper Betle* is extensively used by the Malays and other nations of the East, who consider it as a necessary of life. The mode of taking it in Sumatra consists simply in spreading on the *sirih* (the leaf of the Piper Betle) a small quantity of *chunam* (quicklime prepared from calcined shells), and folding it up with a slice of *pinang* (Areca nut) (vide pp. 87 & 616). From the mastication there proceeds a juice which tinges the saliva of a bright red, and which the leaf and nut, without the lime, will not yield. This hue being communicated to the mouth and lips, is esteemed ornamental, and an agreeable flavour is imparted to the breath. The juice is usually, but not always, swallowed. To persons who are not habituated to this composition it causes giddiness, astringes and excoriates the mouth and fauces, and deadens for a time the faculty of taste. Individuals, when toothless, have the ingredients previously reduced to a paste, that they may dissolve without further effort (Marsden, *Hist. of Sumatra*, 3rd ed. p. 281).

Fig. 160.

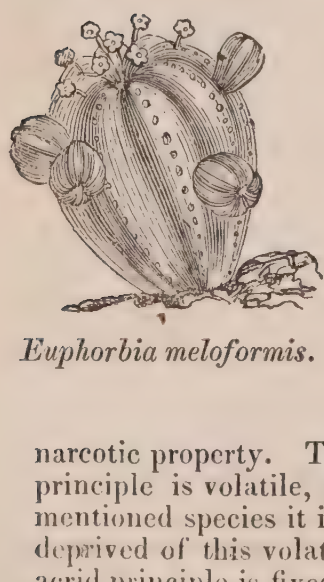


Piper Betle.

Order 27. Euphorbia'ceæ, *Juss.*—The Euphor'bium Tribe.

Essential Character.—*Flowers* monœcious or diœcious. *Calyx* monosepalous; the segments definite, sometimes none, very often increased on the inside by various squamiform or glandular appendages. *Stamens* indefinite, or generally definite, distinct [or monadelphous]; sometimes inserted into the centre of the flower, beneath the rudiments of the pistil. *Anthers* two-celled; the cells sometimes distinct, dehiscing longitudinally on the outer side. *Ovary* superior, sessile, or stipitate, two to three or many-celled; the cells arranged in a circle around the central placenta. *Ovules* solitary or in pairs; suspended from the inner angle beneath the apex. *Styles* as many as the cells; either distinct, or united, or none. *Stigmas* single and compound or many-lobed. *Capsule* of two to three distinct bivalved cells, which often burst elastically. *Seeds* solitary or twin, with an arillus, and attached above to the central placenta. *Embryo* surrounded by a fleshy albumen: cotyledons flat; radicle superior.—*Herbs* or *shrubs* generally lactescent. *Leaves* mostly stipulate, alternate, or rarely opposite. *Flowers* axillary or terminal, usually with bracts; bracts in some cases large and involucriform (*Bot. Gall.*)

Fig. 161.



Euphorbia meloformis.

Fig. 162.

Euphorbia antiquorum.

Some of the Euphorbiaceæ are succulent (as *Euphorbia meloformis* and *E. antiquorum*, figs. 161-2), and have a considerable resemblance to Cacteaceæ, from which they may in general be distinguished by the presence of an acrid milky juice. However, the genus *Mammilaria* (of the family Cacteaceæ) possesses a milky juice.

Properties.—Acridity is the leading quality of the plants of this family. Some species also possess a narcotic property. The acridity resides in the milky juice. In some plants the acrid principle is volatile, as in *Hippomane Mancinella* and *Croton Tiglium:* in the last-mentioned species it is of an acid nature. Some poisonous species, by roasting, are deprived of this volatile principle, and thereby become esculent. In some cases the acrid principle is fixed, as in the substance called, in the shops, "gum" *euphorbium.*

Some euphorbiaceous plants are devoid of acridity, or possess it in a very slight degree only. Von Buch (Nees and Ebermaier, *Med. Pharm. Bot.* Bd. i. S. 355) says, the branches of Euphorbia balsamifera contain a mild sweet juice, which is eaten by the inhabitants of the Canary Isles. The aromatic tonic bark of the Croton Cascarilla is another exception to the very general acridity of euphorbiaceous plants.

This acrid juice pervades various parts of the plants; in the stem it resides principally in the cortical portion. "M. Berthollet has recorded a remarkable instance of the harmless quality of the sap in the interior of a plant, whose bark is filled with a milky proper juice of a poisonous nature. He describes the natives of Teneriffe as being in the habit of removing the bark from the *Euphorbia canariensis*, and then sucking the inner portion of the stem in order to quench their thirst, this part containing a considerable quantity of limpid and non-elaborated sap" (Henslow, *Botany*, in *Lardner's Cyclop.* p. 217).

Cro'ton Tig'lium, Lam. L. E. D.—*The Purging Croton.*

Croton Jamalgota, *Hamilton.*

Sex. Syst. Monœcia, Monadelphia.

(Oleum e seminibus expressum, *L. D.* Expressed Oil of the Seeds, *E.*)

History.—Croton seeds are mentioned by Avicenna (lib. 2$^{\text{ndus}}$, cap. 219) and by Serapion (*De Simplicibus*, cccxlviii.) under the name of *Dend* or *Dende.* The earliest European describer of them is Christopher D'Acosta, in 1578 (Clusius, *Exoticor.* p. 292), who terms them *pini nuclei malucani.* When Commeline wrote, they were known in the shops by the name of *cataputia minor*, although they were sold by itinerants as *grana dilla* or *grana tilli.* They were much employed by medical men in the 17th century, and were known by various names, but principally by that of *grana tiglia.* They, however, went out of use, probably in consequence of the violence and uncertainty of their operation. Their re-employment in modern practice is owing partly to the notices of them by Dr. White and Mr. Marshall, in the first edition of Dr. Ainslie's work (*Materia Medica of Hindostan*, 1813); but principally to the introduction of the oil, in 1819, by Dr. Conwell (*Recherch. sur les Propr. méd. et l'Emploi en Méd. de l'Huile de Croton Tiglium*, 1824). For further historical details, consult Professor H. H. Wilson's paper in the *Trans. of the Med. and Phys. Society of Calcutta*, vol. i. p. 249.

Botany. *Gen. Char.*—*Flowers* monœcious, or very rarely diœcious. *Calyx* five-parted. *Males:*—*Petals* five. *Stamens* ten or more, distinct. *Females:*—*Petals* none. *Styles* three, divided into two or more partitions. *Capsule* tricoccous (Adr. de Jussieu).

Sp. Char.—Arboreous. *Leaves* oblong-ovate, acuminate, slightly serrate, smooth. *Stamina* fifteen, distinct. Each *cell* of the fruit filled by the seed.

A middle-sized *tree*, from fifteen to twenty feet high. *Bark* smooth, ash-coloured. *Leaves* sometimes cordate, and with two flat round glands at their base; when young, covered on both surfaces, but especially the lower one, with minute stellate hairs. At the base of the leaves are two flat round glands. *Raceme* terminal, erect, simple. *Petals* of male flower white.

Hab.—Continent of India, islands forming the Indian Archipelago, and Ceylon.

The *Croton Pavana* (Hamilton, *Trans. Linn. Soc.* vol. xiv. 257) is said also to yield tiglium or croton seeds. It is distinguished from C. Tiglium by having only ten stamina, and by the seeds being much smaller than the cells in which they are placed. C. Pavana is a native of Ava, north-eastern parts of Bengal? Amboyna?? Dr. Hamilton thinks it is the *Granum Moluccum* of Rumphius.

Description.—*Croton seeds* (*semina tiglii* seu *semina crotonis*; *grana* *tiglii; purging nuts* of some authors), in size and shape are very similar to castor seeds. Viewed laterally, their shape is oval or oval-oblong: seen from either extremity, they have a rounded or imperfectly quadrangular form. Their length does not exceed six lines; their thickness is $2\frac{1}{2}$ to 3 lines; their breadth, 3 or 4 lines. Sometimes the surface of the seeds is yellowish, owing to the presence of an investing lamina (epidermis?). The testa is dark-brown, or blackish, and is marked with the ramifications of the raphé. The endocarp, or internal seed-coat, is thin, brittle, and of a light colour. It incloses a yellowish oily albumen, which envelopes the embryo, whose cotyledons are foliaceous or membranous. The seeds are without odour; their taste is at first mild and oleaginous, afterwards acrid and burning. When heated, they evolve an acrid vapour.

According to Dr. Nimmo (*Quart. Journ. of Science*, vol. xiii. p. 65) 100 parts of the seeds consist of

Shell or seed-coats	36
Kernel, or nucleus	64
	100

Composition.—Croton seeds were analyzed by Brandes (Gmelin, *Handb. d. Chem.* Bd. ii. S. 1320), with the following results:—

Volatile oil	traces.
Fixed oil, with *crotonic acid*, and an alkaloid (*crotonin*)	17·00
Crotonates and colouring matter	0·32
Brownish yellow resin, insoluble in ether	1·00
Stearine and wax	0·65
Extractive, sugar, and malates of potash and lime	2·05
Starchy matter, with phosphates of lime and magnesia	5·71
Gum, and gummoin	10·17
Albumen	1·01
Gluten	2·00
Seed-coats, and woody fibre of the nucleus	39·00
Water	22·50
Croton seeds	101·41

1. *Crotonic Acid.*—Though this acid exists ready formed in the seed, yet an additional quantity of it is obtained when the oil is saponified. Brandes thinks that there exists in the seeds an extremely acrid volatile oil, which, by the action of air and water, is converted into crotonic acid. This acid is a volatile, very acrid, fatty acid, which congeals at 23° F., and, when heated a few degrees above 32° F., is converted into vapour, having a strong nauseous odour, and which irritates the eyes and nose. It has an acrid taste, and acts as a powerful local irritant. It is to this acid that the cathartic and poisonous qualities of croton oil are principally referrible. Pelletier and Caventou think that it is not sufficiently energetic to be the sole active principle. It unites with bases forming a class of salts called crotonates, which are inodorous. The crotonate of ammonia precipitates the salts of lead, copper, and silver, white; and the sulphate of iron, yellow. Crotonate of potash is crystalline, and dissolves, with difficulty, in alcohol. Crotonate of barytes is soluble in water; but crotonate of magnesia is very slightly soluble only in this liquid.

2. *Crotonin.*—The alkali which Brandes found in these seeds, and to which he gave the name of *Crotonin*, appears to be identical with the *Tiglin* of Adrien de Jussieu. It is crystalline, has an alkaline reaction, is fusible and combustible with flame, leaving a carbonaceous residuum. It is insoluble in water, dissolves very slightly only in cold, but easily in hot, alcohol. If sulphuric or phosphoric acid be added to the spirituous solution, small prisms (sulphate or phosphate of crotonin?), decomposable by heat, are obtained by slow evaporation. Soubeiran (*Nouv. Traité de Pharm.* t. ii. p. 103) thinks that crotonin is a combination of magnesia with a fatty acid.

3. *Resin*.—Is brown and soft; and has a disagreeable odour, on account, doubtless, of the oil which it retains. It is soluble in alcohol, but insoluble in ether and in water. The alkalies dissolve it by separating a whitish matter. It contributes to the purgative properties of croton oil.

4. *Tiglium* or *Croton Oil* (*oleum tiglii* seu *oleum crotonis*).—This is the expressed oil of the seeds. It is imported from the East Indies, principally from Madras, but in part from Bombay. As met with in English commerce, it is yellowish-brown or amber-coloured, and has an unpleasant odour and an acrid taste. It reddens litmus, and is soluble in alcohol. It consists, according to Dr. Nimmo (*op. supra cit.*), of

An acrid matter	4·5
Bland fixed oil	5·5
Croton oil	10·0

The *acrid matter* is extracted from croton oil by alcohol. The alcoholic solution reddens litmus, and, when dropped into water, causes a cloudiness. Dr. Nimmo supposed this acrid matter to be of a resinous nature; but the investigations of Pelletier and Caventou, and Brandes, have shown that it is a mixture of *crotonic acid* and *crotonin* [and *resin?*]. According to Mr. Twining (Dierbach, *op. cit.*) there are two kinds of croton oil met with in commerce. One is dark yellow and thickish; the other is straw-coloured. The first is the most energetic. These oils may, perhaps, be obtained from different plants; the one from Croton Tiglium, the other from Croton Pavana.

Physiological Effects. 1. *Of the Seeds.* (*a.*) *On animals generally.*—Croton seeds are powerful local irritants or acrids, causing inflammation in those living parts with which they are placed in contact. Orfila (*Toxicol. Gén.*,) found that three drachm sbeing introduced into the stomach of a dog, and the œsophagus tied to prevent vomiting, caused death in three hours; and, on examination of the body, the alimentary canal was found to be in a state of inflammation. In another experiment, a drachm caused death under the same circumstances. A drachm, also, applied to the cellular tissue of the thigh, was equally fatal. A dose of from twenty to thirty grains of the powder of the kernel given to the horse causes, in six or eight hours, profuse watery stools, and is recommended by some veterinarians as a purgative; but the uncertainty of its operation, and the griping and debility which it occasions, are objections to its use (Youatt, *the Horse*, in *Libr. of Useful Knowledge*). Lansberg (Wibmer, *Arzneim. ü. Gifte*, Bd. ii. S. 222) found that twenty of the seeds killed a horse, by causing gastro-enteritis. The pulse was frequent, small, and soft.

(*b.*) *On man.*—In the human subject, a grain of the croton seed will frequently produce full purgation. Mr. Marshall (Ainslie, *Mat. Indica*, vol. i. p. 104) says that this quantity, made into two pills, is about equal in power to half a drachm of jalap, or to six grains of calomel. The operation, he adds, is attended with much rumbling of the bowels; the stools are invariably watery and copious. Dr. White recommends the seeds to be torrefied, and deprived of their seed-coats, before employing them (*Ibid.*) Dr. Wallich informed me that the labourers in the Calcutta Botanic Garden were in the habit of taking one of these seeds as a purgative, but that on one occasion this dose proved fatal.

The seed-coats, the embryo, and the albumen, have each in their turn been declared to be the seat of the acrid principle: I believe the remarks which I shall have to make with respect to the seat of the acridity of castor-oil seeds, will apply equally well to that of croton seeds.

It would be interesting to know whether the seeds of Croton Pavana are equally active with those of Croton Tiglium; and, also, whether the seeds of both species are found in commerce.

2. Of the Oil. (*a.*) *On animals generally.*—On vertebrated animals (horses, dogs, rabbits, and birds), it acts as a powerful local irritant or acrid. When taken internally, in moderate doses, it operates as a drastic purgative; in large doses, as an acrid poison, causing gastro-enteritis. Moiroud (*Pharm. Vétér.* p. 272) says, that from twenty to thirty drops of the oil are, for the horse, equal to two drops for man; and that twelve drops, injected into the veins, cause alvine evacuations in a few minutes. Thirty drops, administered in the same manner, have caused, according to this veterinarian, violent intestinal inflammation and speedy death. A much less quantity (three or four drops) has, according to Hertwich (Wibmer, *Arzneim. ü. Gifte*, Bd. ii. S. 218), terminated fatally when thrown into the veins. After death the large intestines have been found to be more inflamed than the small ones. Flies, which had eaten some sugar moistened with the oil of croton, died in three or four hours,—the wings being paralyzed or immoveable before death.

(*b.*) *On man.—Rubbed on the skin* it causes rubefaction and a pustular or vesicular eruption, with sometimes an erysipelatous swelling of the surrounding parts. When rubbed into the abdomen, it sometimes, but not invariably, also purges. Rayer (*Treat. on Diseases of the Skin*, by Dr. Willis, p. 367) mentions a case in which thirty-two drops rubbed in upon the abdomen produced purging, large vesicles upon the abdomen, swelling and redness of the face, with small prominent, white, crowded vesicles on the cheeks, lips, chin, and nose. *Applied to the eye*, it gives rise to violent burning pain, and inflammation of the eye and face. In one case it produced giddiness (Dierbach, *Neueste Entd. in d. Mat. Med.* 1837, p. 201). Ebeling obtained relief by the application of a solution of carbonate of potash. *Swallowed in small doses*, as of one or two drops, it usually causes an acrid burning taste in the mouth and throat, and acts as a drastic purgative, giving rise to watery stools, and frequently increasing the urinary secretion. Its operation is very speedy. Frequently it causes evacuations in half an hour: yet it is somewhat uncertain. Sometimes six, eight, or even ten drops, may be given at a dose, without affecting the bowels. In moderate doses it is less disposed to cause vomiting or griping than some other cathartics of equal power. Mr. Iliff (*Lond. Med. Rep.* vol. xvii.), however, observes that it produces nausea and griping more frequently than has been supposed.

The following is the only case, with which I am acquainted, of poisoning by an *excessive dose* of croton oil:—A young man, aged 25, affected with severe typhoid fever, swallowed by mistake two and a half drachms of croton oil. At the end of three-quarters of an hour the skin was cold, and covered with cold sweats; the pulse and action of the heart scarcely perceptible; respiration difficult; the points of the toes and fingers, the parts around the eyes and the lips, blue, as in malignant cholera; abdomen sensible to the touch; but no vomiting. In an hour and a half there were excessive and involuntary alvine evacuations; sensation of burning in the œsophagus; acute sensibility of the abdomen; skin colder; respiration and circulation difficult; the cyanosis extended over the whole body; the skin became insensible; and death occurred, with some of the symptoms of asphyxia, four hours after the poison was swallowed. No lesion was found in the gastric membrane. The intestines presented ulcerations, such as are characteristic of typhus fever (*Journ. de Chim. Méd.* t. v. p. 509, 2[nde] Sér.)

In comparing croton oil with other violently acrid purgatives, we find it distinguished by its speedy operation, the great depression of the vascular system, as well as the general feeling of debility which it produces, and by the uncertainty of its operation.

Uses.—The value of croton oil as an internal remedial agent depends principally on two circumstances: first, its powerful and speedy action as a drastic cathartic, by which it is adapted for obviating constipation, or for operating on the bowels as a counter-irritant; and, secondly, on the smallness of the dose, which in practice presents many advantages. These circumstances render it peculiarly applicable in cases requiring powerful and speedy catharsis, and in which the patient cannot swallow, or does so with extreme difficulty, as in *trismus*, *coma*, and *some affections of the throat;* or where he will not swallow, as in *mania.* In all such cases the oil may be dropped on the tongue. *In obstinate constipation,* whether from the poison of lead, or from other causes, it has sometimes succeeded where other powerful cathartics had been tried in vain. It is especially serviceable where the stomach is irritable, and rejects more voluminous purgatives; and it is of course objectionable in all inflammatory conditions of the digestive tube. *In torpid conditions of the intestinal canal*, *in tendency to apoplexy*, *in dropsy* unconnected with inflammation, *in paralysis*—in a word, in any cases in which a powerful and speedy intestinal irritant is required, either for the purpose of evacuating the canal merely, or for acting as a revulsive or counter-irritant, and thereby relieving distant parts, croton oil is a very useful, and, on many occasions, most valuable cathartic. In employing it, two cautions are necessary: it must be avoided, or at least used with great caution, in extreme debility; and it is improper in inflammatory affections of the digestive organs. The great drawback to its use is its uncertainty. In one case it acts with extreme violence; in another, it scarcely produces any effect. *In the diseases of children,* where a powerful purgative is required, croton oil has been administered, on account of the minuteness of the dose, and the facility of its exhibition. In hydrocephalus, and other head affections of children, I have several times used it where other cathartics had failed, or where extreme difficulty was experienced in inducing the patients to swallow the more ordinary remedies of this class. In some of these it has disappointed me. In the case of a child of four years of age, affected with incipient hydrocephalus, I gave six doses, of one drop each, of the oil without any effect. *In uterine obstructions* (chlorosis and amenorrhœa) it has occasionally proved serviceable. *In tape-worm* it has been recommended; but I have no experience of its efficacy.

Rubbed on the skin, croton oil has been employed to produce rubefaction and a pustular eruption, and thereby to relieve diseases of internal organs, on the principle of counter-irritation, before explained (p. 45). *Inflammation of the mucous membrane lining the air-passages*, *peripneumonia*, *glandular swellings*, *rheumatism*, *gout*, and *neuralgia*, are some of the diseases against which it has been applied in this way, and doubtless frequently with benefit. It is sometimes used in the undiluted form, but more commonly with twice or thrice its volume of olive oil, oil of turpentine, soap liniment, alcohol, ether, or some other convenient vehicle. But, in all the cases just enumerated, it has never appeared to me to present any advantage over many other counter-irritants in common use, as emetic tartar; while the chance of causing purging is, in some cases, an objection to its use; and its greater cost sometimes precludes its employment on a large scale in pauper establishments. Frictions with it on the abdomen have been used to promote alvine evacuations; but it frequently fails to produce the desired effect. To promote the absorption of the oil in these cases, it should be dissolved in ether or alcohol, and the frictions are to be assiduously made.

Administration.—*Croton seeds* are rarely or never used in this country. Their farina may, however, be given in doses of a grain or two. *Croton oil* is exhibited in doses of one to two or three drops. In some instances it is simply placed on the tongue, as in coma, tetanus, mania, &c.; or it may be taken in a tea-spoonful of syrup. These methods of administering it are objectionable, on account of the acrid taste produced. The usual mode of employing it is in the form of pill, made with conserve of roses or bread-crumb. Some have employed it in the form of emulsion, flavoured with some carminative oil or balsamic substance; but the burning of the mouth and throat, to which it gives rise, is an objection to its use. A *tincture* may be prepared by digesting either the oil or the seeds in alcohol. *Croton soap*, prepared with croton oil and caustic soda, is kept by Mr. Morson, of Southampton Row, Russell Square. It is, in fact, a crotonate of soda. It may be used as a purgative, in doses of from one to three grains. It has been said that the alkali diminishes the acrimonious property of the oil without affecting its cathartic powers—a statement, however, which is highly improbable.

Antidotes.—In a case of poisoning by the seeds or oil, the first object is to remove the oil from the stomach. Mild, demulcent, and emollient drinks are then to be given. Alkaline substances have been recommended as chemical antidotes, but their efficacy is not proved. Full doses of opium will be requisite to check the diarrhœa. To relieve a failing circulation, ammonia may be given, and the warm bath employed. To combat the inflammatory symptoms, blood-letting may be used, if the condition of the vascular system permit its employment.

Cro'ton Eleute'ria, Swartz, E.—*The Sea-side Bal'sam* or *Sweet Wood.*

Sex. Syst. Monœcia, Monadelphia.

(Cortex, Bark; Cascarilla, *E.*)

History.—Cascarilla or Eleutheria bark was first mentioned by Stisser in 1686 (*De machinis fumiductoriis*, Hamburgh, 1686), at which time it was used in this country, mixed with tobacco, for smoking. In 1754 Catesby (*Nat. Hist. of Carolina, Florida, and the Bahama Islands*) noticed and figured a plant, which, he said, grew plentifully on most of the Bahama Islands, and yielded Cascarilla bark, or, as he called it, "The Ilatheria bark, *La* Chacrilla." This plant is generally supposed to be the *Croton Cascarilla*, Linn. (C. *lineare*, Jacq.); and several reasons led me, at one time (see *Lond. Med. Gaz.* vol. xx. p. 489), to think that it might be the source of the cascarilla bark of the shops—an opinion also entertained by Dr. Wood (*United States Dispensatory*). Dr. Lindley (*Fl. Med.* p. 179) adduced several reasons for believing that the *Croton Eleuteria* was the true species, as Drs. Wright and Woodville had already asserted. The subsequent receipt, by Dr. Lindley, of specimens of the plant, from Mr. Lees, of the Bahama Islands, has fully confirmed the accuracy of Dr. Lindley's opinion. The *Croton Cascarilla*, Don, *L.* (*C. Pseudo-China*, Schiede,) yields Copalchi (not Cascarilla) bark.

BOTANY. *GEN. CHAR.*—See *Croton Tiglium.*

SP. CHAR.—*Leaves* ovate, acuminate, quite entire, smooth, beneath silvery, with scales. *Racemes* compound axillary. *Stem* arborescent (Swartz, *Fl. Ind. occ.*)

Branches and *twigs* angular, somewhat compressed. *Leaves* stalked, alternate, with a short but obtuse point. *Flowers* monœcious, subsessile. *Males:*—*Petals* whitish. *Stamens* ten to twelve. *Ovary* roundish: *styles* three, bifid; *stigmas* obtuse. *Capsule* roundish, minutely warted, not much bigger than a pea, with three furrows, three cells, and six valves (Ibid.)

HAB.—The Bahama Islands, Jamaica.

DESCRIPTION.—*Eleutheria* or *Cascarilla bark* (*cortex eleuteriæ* seu *cascarillæ*) is in the form of fragments, or quills, of about one or two, more rarely three or four, inches long, the fragments being thin, and usually curved both longitudinally and transversely, the quills varying in size from that of a writing pen to that of the little finger. The bark is compact, hard, moderately heavy, and has a short resinous fracture. Some of the pieces are partially or wholly (not fibrous or splintery, as in cinchona barks) covered with a whitish, rugous epidermis, cracked both longitudinally and transversely. The cortical layers are of a dull brown colour. The taste of this bark is warm, spicy, and bitter; its odour is peculiar, but agreeable. When burned, it evolves a pleasant odour (which has been compared by Pfaff to that of vanilla or amber when heated), on which account it is a constituent of *fumigating pastiles.*

Fée (*Essai sur Cryptogames*, 1824) has enumerated no less than forty-three species of lichens found on this bark. With one exception (*Parmelia perlata*, which I have never seen on cascarilla), every one of these lichens has an adherent, crustaceous, amorphous thallus. A very common species is *Lecidea Arthonioides*, Fée: the thallus of which is very white, and the apothecia minute, round, and black.

COMMERCE.—It is imported from Nassau, in New Providence (one of the Bahama Islands). Of sixteen imports, which I have been enabled to trace since 1833 in the bills of entry, eight were from Nassau, three from Belize, and two from Lima; the others were from European ports. Some of these probably were returned goods. Those from Belize may perchance be the produce of the Bahamas. 4,579 lbs. paid duty (one penny per lb.) in 1838.

COMPOSITION.—Cascarilla bark was analyzed by Trommsdorf (Gmelin, *Handb. d. Chem.* ii. 1319), who obtained from it the following substances:—*Volatile oil* 1·6, *bitter resin* 15·1, *gum* and *bitter matter with trace of chloride of potassium* 18·7, *woody fibre* 65·6. Meissner (*Ibid.*) detected in the ashes of the bark the *oxide of copper*. Brandes (*Berl. Jahrb.* xxiii.) has announced the existence of a peculiar alkaline substance (*cascarillina*).

1. *Volatile Oil of Cascarilla.*—It possesses the odour and taste of the bark. Its sp. gr. is 0·938. Its colour is variable, sometimes being greenish, at others yellow or blue. Nitric acid converts it into a yellow, pleasant, smelling resin. By distillation with water the bark yields about 1-120th of its weight of this oil.

2. *Resin.*—Separated from the alcoholic tincture of the cascarilla by the addition of

water. It is reddish brown; has a balsamic, slightly bitter, not astringent taste; and, when thrown on hot coals, evolves an agreeable odour.

3. *Extractive.*—Has a bitter, not balsamic taste. Its watery solution reddens litmus, and is unchanged by either ferruginous solutions or tincture of nutgalls.

Chemical Characteristics.—The sesquichloride of iron deepens the colour of the infusion of cascarilla. The tincture of nutgalls causes turbidness, and at the end of twenty-four hours a very slight precipitate. The alcoholic tincture deposits some resin on the addition of water.

Physiological Effects.—Cascarilla bark belongs to the *aromatic bitters,* before noticed (p. 80). That is, it produces the combined effect of an aromatic and of a moderately powerful tonic; but it does not possess any astringency. Some pharmacologists place it with aromatics, others with tonics. Cullen (*Mat. Med.*), though at one time uncertain as to which of these classes it belonged, ultimately classed it with the tonics. Kraus (*Heilmittellehre*, S. 401) states, that moderate doses give rise, in very susceptible, especially in sanguine, subjects, to narcotic effects; but though I have frequently employed it, I never observed an effect of this kind. Mixed with tobacco, and used for smoking, it is said to cause giddiness and intoxication (*United States Dispensatory*).

Uses.—Cascarilla has been employed as a substitute for cinchona; and, although it is inferior to the latter in tonic and febrifuge qualities, its aromatic quality frequently enables it to sit easily on the stomach, without causing either vomiting or purging, which, in irritable affections of the alimentary canal, cinchona is apt to produce. In this country it is principally employed in those forms of dyspepsia requiring an aromatic stimulant and tonic. It is also used in cases of debility generally; and in chronic bronchial affections, to check excessive secretion of mucus. In Germany, where it is a favourite remedy, it is used in many other cases; such as low, nervous fevers, intermittents, the latter stages of diarrhœa, and dysentery.

Administration.—The *powder* may be given in doses of from ten grains to half a drachm; but it is a less agreeable form than the infusion.

1. *Infusum Cascarillæ*, L. E. D.—(Cascarilla bark, bruised, ʒiss. [℥ss. *D.*]; Boiling [distilled, *L.*] Water, Oj. [Oss. *D*]. Macerate for two hours in a vessel lightly covered, and strain [through linen or calico, *E.*]). A light and aromatic bitter tonic. It is a good vehicle for acids and alkalies. The tincture of cascarilla is usually conjoined with it. Dose, from f℥i. to f℥ii.

2. *Mistura Cascarillæ composita*, L.—(Infusion of Cascarilla, f℥xvii.; Vinegar of Squill, fʒi.; Compound Tincture of Camphor, f℥ii. Mix). Said to be useful in chronic affections of the mucous membranes of the lungs. Dose, from f℥i. to f℥iss. twice or thrice a day.

3. *Tinctura Cascarillæ*, L. E. D.—(Cascarilla bark, bruised [in moderately fine powder, *E.*], ℥v. [ʒiv. *D.*]; Proof Spirit, Oij. [wine measure, *D.*] Macerate for fourteen [seven, *D.*] days, and filter, *L.* "Proceed by percolation or digestion, as afterwards directed for tincture of cinchona," *E.*) Generally employed as an adjunct to tonic and stomachic infusions. Dose, from fʒi. to fʒii.

Ric'inus commu'nis, Linn. L. E. D.—*The Castor-Oil Plant*, or *Palma Christi.*

Sex. Syst. Monœcia, Monadelphia.

(Oleum e seminibus expressum, *L.* Expressed oil of the seeds, *E.* Oleum e seminibus, *D.*)

History.—The castor-oil plant was known in the most ancient times. Caillaud found the seeds of it in some Egyptian sarcophagi, supposed to have been at least 4000 years old (*Dict. Univ. de Mat. Méd.* t. vi.) Whether this is, as some persons imagine, the plant alluded to in the Bible (*Jonah*, ch. iv. 6), and which in our translation is called *the gourd*, I cannot pretend to decide. The pious fathers, Jerom and Augustin, differed so much in their opinions as to what was the particular plant meant in the passage just referred to, that from words, we are told, they proceeded to blows! (Harris, *Nat. Hist. of the Bible.*)

The ancient Greeks were acquainted with the Ricinus, for both Herodotus (*Euterpe*, 94) and Hippocrates (*De Nat. Mulieb.* p. 573, ed. Fœs.) mention it; and the latter employed the root in medicine. Dioscorides (lib. iv. cap. 164) calls it the Κίκι or Κρότων. It was termed Κρότων by the Greeks, and *Ricinus* by the Romans, on account of the resemblance of its seeds to a little insect bearing these names, which infests dogs and other animals, and whose common name in English is the *tick.*

Botany. *Gen. Char.*—*Flowers* monœcious. *Calyx* three to five, parted, valvate. *Petals* none. *Filaments* numerous, unequally polyadelphous; cells of the *anther* distinct, below the apex of the filament. *Style* short; *stigmas* three, deeply bipartite, oblong, coloured, feathery; *ovary* globose, three-celled, with an ovule in each cell. *Fruit* generally prickly, capsular, tricoccous. *Trees, shrubs*, or *herbaceous* plants, sometimes becoming arborescent. *Leaves* alternate, stipulate, palmate, pellate, with glands at the apex of the petiole. *Flowers* in terminal panicles, the lower male, the upper female; all articulated with their peduncles, and sometimes augmented by bi-glandular bracts (*Lindley*).

Sp. Char.—*Leaves* peltato-palmate; the lobes lanceolate, serrated. *Stem* herbaceous, pruinose. *Stigmas* three, bifid at the apex. *Capsule* covered with spines (*Bot. Gall.*)

Fig. 163.

Ricinus communis.

The *stems* of plants growing in this country are round, greenish or reddish-brown, and blue pruinose, and branched. *Leaves* on long round petioles, eight or ten-lobed. A large scutelliform gland on the petiole, near its junction with the lamina. *Filaments* capillary, branched. *Stigmas* reddish. *Capsules* supported on stalks, which are somewhat longer than the capsules themselves.

When cultivated in Great Britain, Ricinus communis is an annual, seldom exceeding three or four feet high; but in other parts of the world it is said to be perennial, arborescent, and to attain a height of fifteen to twenty feet. Dr. Roxburgh (*Fl. Indica*, vol. iii. p. 689) says, that in India several varieties are cultivated, "some of them growing to the size of a pretty large tree, and of many years' duration." Clusius (*Exot.* p. 299) saw it in Spain with a branched trunk as thick as a man's body, and of the height of three men. Belon (*Observ.* lib. i. cap. 18) also tells us that in Crete it endures for many years, and requires the use of ladders to mount it. Ray (*Hist. Plant.* vol. i. p. 166) found it in Sicily as large as our common alder trees, woody, and long-lived; but it has been a question with botanists whether these arborescent and other kinds are mere varieties of, or distinct species from, the ordinary Ricinus communis.

The following (? varieties or distinct species) are enumerated by Nees and Ebermaier (*Handb. d. Med. Pharm. Botan.*) as common in gardens, and as distinguished principally by the colour and pruinose condition of the stem—characters which, however uncertain in other cases, appear here to be constant.

Ricinus africanus (Willd.)—Stem not pruinose, green, or on one side reddish. The fruit-racemes abbreviated, the fruit-stalk longer than the capsule. Seeds attenuated on one side, marbled gray and yellowish-brown. [Arborescent. Cultivated in Bengal (Hamilton, *Linn. Trans.* vol. xiv.)].

Ricinus macrophyllus (H. Berol.)—Nearly allied to the foregoing: stem quite green, not pruinose. Fruit racemes elongated, fruit-stalk shorter than the fruit.

Ricinus leucocarpus (H. Berol.)—Stem pale green, white pruinose. Fruit-stalk as long as the fruit. The unripe fruit and prickles almost quite white.

Ricinus lividus (Willd.)—Stem, petiole, and midrib, purple red, not pruinose. Nearly allied to R. africanus, and, like this, more woody and perennial. [Arborescent. Cultivated in Bengal (Hamilton)].

Ricinus viridis (Willd.)—Stem pale green, blue pruinose, by which it is distinguished from R. macrophyllus. Seeds somewhat smaller, more oval, marked with white and fine brown. [Herbaceous. Cultivated in Bengal (Hamilton)].

Description.—*Castor seeds* (*semina ricini*, seu *sem. cataputiæ majoris*) are oval, somewhat compressed, about four lines long, three lines broad, and a line and a half thick: externally, they are pale gray, but marbled with yellowish-brown spots and stripes. The seed-coats consist, according to Bischoff (*Handb. d. Bot. Term.* pp. 508, 510, and 512, tab. xl. fig. 1875), of a smooth external coat (*epidermis seminalis*). 2dly, a diform, hard *testa*, consisting of two layers, an external, thick, and dark-brown one, and an internal one, thinner and paler. 3rdly, a *cuticula nuclei* or *membrana interna*. The fleshy tumid *cicatricula stomatis* (also termed *strophiola*) is very evident at the upper end of the seed; beneath it is the small *hilum*, from which passes downwards the longitudinal *raphé*. (Bischoff, *Ibid.* p. 515, &c. tab. xli. fig. 747). The *chalaza* is colourless (*Ibid.* p. 518, tab. xliii. fig. 1901). The *nucleus* of the seed consists of oily *albumen*, and an *embryo*, whose cotyledons are membranous or foliaceous.

Composition.—The only analysis of these seeds, as yet published, is that of Geiger (*Handb. d. Pharm.* Bd. ii. S. 1671). The following are his results:—

a. Seed coats	Tasteless resin and extractive	1·91	23·82
	Brown gum	1·91	
	Ligneous fibre	20·00	
b. Nucleus of the seeds	Fatty oil	46·19	69·09
	Gum	2·40	
	Caseum (albumen)	0·50	
	Ligneous fibre with starch? (hardened albumen?)	20·00	
Loss (moisture)			7·09
			100·00

1. *Volatile acrid principle* (*? Ricinic and Elaïodic acids*).—This principle is not mentioned by Geiger, and its existence has been doubted or denied by others. But the following as well as other facts establish, in my opinion, its presence:—First, Guibourt (*Journ. de Chim. Méd.* t. i. p. 111) experienced a peculiar feeling of dryness of the eyes and throat, in consequence of having been exposed to the vapour arising from a vessel in which bruised castor seeds and water were boiling. Secondly, Planche obtained a permanent, odorous principle, by distilling a mixture of water and castor oil. Bussy and Lecanu (*Journ. de Pharm.* t. xiii. p. 80) ascribe the occasional acridity of the oil to the production of fatty acids, by the action of the air on it.

The acrid principle (whatever its nature may be) appears to reside in both the *albumen* and *embryo* of the seed. Jussieu (quoted by Decandolle, *Essai sur les Propr. des Plantes*, p. 263) and some others have asserted that it resided exclusively in the embryo; while Boutron-Charlard and Henry jun. (*Journ. de Pharm.* t. x. p. 466) declare the albumen to be the exclusive seat of it. But any unprejudiced person may soon satisfy himself, by tasting separately the embryo and albumen, that both parts possess acridity. Dierbach (quoted by Nees and Ebermaier, *Handb. d. Med.-pharm. Botan.*) states, that in fresh seeds the innermost seed-coat contains the acrid principle. If this be correct, it is most remarkable that the same coat, when dry, contains none.

2. *Fixed Oil; Castor Oil* (*Oleum Ricini*, L. E. D.)—The following are the modes of preparing castor oil in India, America, and Jamaica. (*a.*) *In India.*—It is prepared either by expression or coction; the latter method is apt to occasion a little rancidity. In the southern provinces of India it is thus procured:—The seeds are soaked in cold water, and afterwards boiled in water, then dried in the sun: they are then bruised in a mortar, and boiled in water a second time; the contents of the pot being continually stirred until the oil appears at the top, when it is carefully strained off, and bottled for use. (Ainslie, *Mat. Med.* vol. i. p. 256.) The best East Indian castor oil is sold in the shops as *cold drawn.*

(*b.*) *In the United States.*—The cleansed seeds are gently heated in a shallow iron reservoir, to render the oil liquid for easy expression, and then compressed in a powerful screw-press, by which a whitish oily liquid is obtained, which is boiled with water in clean iron boilers, and the impurities skimmed off as they rise to the surface. The water dissolves the mucilage and starch, and the heat coagulates the albumen, which forms a whitish layer between the oil and water. The clear oil is now removed, and boiled with a minute portion of water until aqueous vapours cease to arise: by this process an acrid volatile matter is got rid of. This oil is put into barrels, and in this way is sent into the market. Good seeds yield about 25 per cent. of oil. (*United States Dispensatory.*)

(*c.*) *In Jamaica.*—The bruised seeds are boiled with water in an iron pot, and the liquid kept constantly stirred. The oil which separates, swims on the top, mixed with a white froth, and is skimmed off. The skimmings are heated in a small iron pot, and strained through a cloth. When cold, it is put up in jars or bottles for use. (Wright, *Med. Plants of Jamaica,* in *Lond. Med. Journ.* vol. viii.)

Physical properties and varieties.—Castor oil is a thickish fluid oil, usually of a pale yellow colour, with a slightly nauseous odour and a mild taste. It is lighter than water, its sp. gr. being, according to Saussure, 0·969 at 55° F. When cooled down to about 0°, it congeals into a transparent yellow mass. By exposure to the air it becomes rancid, thick, and ultimately congeals, without becoming opaque, and hence it is called a *drying oil.* When heated to a little more than 500° F. it begins to decompose.

East Indian Castor Oil is the principal kind employed in this country. It is imported from Bombay and Calcutta. It is an oil of exceedingly good quality (both with respect to colour and taste), and is obtained at a very low price. It is procured from Ricinus communis and R. lividus.

West India Castor Oil I am not well acquainted with, not having been able to procure authentic samples of it.

American or *United States Castor Oil* is, for the most part, imported from New York. All the samples which I have examined have been of very fine quality, and, in my opinion, had a less unpleasant flavour than the East Indian variety. Our druggists object to it, on the ground of its depositing a white substance (stearin?) in cold weather—a circumstance which has led some persons to imagine it had been mixed with olive oil

I have seen one sample of *Castor Oil from New South Wales.* It was of a very dark colour.

Solubility.—In absolute alcohol, and in pure sulphuric ether, castor oil is completely soluble. In this respect it agrees with palm oil, but disagrees with all the ordinary fixed oils. Hence alcohol has been proposed as a means of detecting adulteration of castor oil, the adulterating oil not being soluble in alcohol. [Castor oil "is entirely dissolved by its own volume of alcohol." *Ph. Ed.*] Stoltze (Gmelin, *Handb. d. Chemie*) says benzoic acid promotes the solution of castor oil in rectified spirit.

Commerce.—Castor oil is imported in casks, barrels, hogsheads, and duppers. The duty on it is 1s. 3d. per cwt. Of 393,191 lbs. imported in 1831, there came from the East Indies 343,373 lbs., from British Northern Colonies of America 25,718 lbs., from the United States 22,669 lbs., and from the British West Indies 1,407 lbs. (*Parliament Returns* for 1831).

Composition.—The following is the *ultimate* composition of castor oil:—

	Saussure.	Ure.
Carbon	74·178	74·00
Hydrogen	11·034	10·29
Oxygen	14·788	15·71
Castor oil	100·000	100·00

The *proximate* constituents of the oil have not been determined. They are neither stearin nor olein, since neither margaric nor oleic acid is produced by the saponification or distillation of castor oil. "This oil," observe MM. Bussy and Lecanu, "cannot be regarded as a simple, immediate principle, but as *a compound organic product, resulting from the mixture of at least two different substances.*" If we assume that the products of saponification pre-exist in the fatty body used in the process—an assumption recently adopted with regard to stearin and spermaceti (*Ann. de Chim.* lxii. 5, and lxiii. 148)—castor oil may be regarded as a compound of three fatty acids, viz. *ricinic*, *elaïodic*, and *margaritic acids*, combined with, and saturated by, *glycerin*.

Castor oil is distinguished from all other fixed oils, by, first, the products obtained by its saponification; secondly, the products procured when we submit it to distillation; thirdly, the peculiar fatty matter which it yields, when acted on by hyponitrous acid or nitrate of mercury.

Products of Saponification.	Products of Distillation.	Product of the Action of Hyponitrous Acid.
100 parts of Castor oil yielded:	(Average of two experiments):	
1. Fatty acids (viz. *ricinic*, *elaïodic*, and *margaritic acids*) 94	1. Distilled liquid . . 33·5 (*a.*) Water. (*b.*) Acetic acid. (*c.*) Volatile oil. (*d.*) Fatty acids (*ricinic*, *elaïodic*, [& *margaritic*?] *acids*.)	Palmin (yielding by saponification, and, therefore, probably consisting of, *palmic acid* and *glycerin*).
2. Glycerin 8	2. Solid residuum . . 63·0	
Total . . . 102	3. Loss (inflammable gas) 3·5	
	Castor oil . . . . . 100·0	

(*a.*) *Volatile Oil.*—Obtained by distillation. Separated from acetic acid by washing with water, and from the fatty acids by distillation with water. It is limpid and colourless, has a peculiar odour, an acrid taste, and a sp. gr. of 0·815. It is soluble in alcohol and ether, but is insoluble in a solution of potash. By long-continued exposure to a temperature of 23° F. it becomes crystalline.

(*b.*) *Fatty acids* (*Ricinic, Elaïodic, and Margaritic acids.*)—These are very acrid, soluble in alcohol, ether, and a weak aqueous solution of potash. They unite with bases to form salts. The saline compounds formed by the union of these acids with potash, soda, magnesia, and lead, are soluble in alcohol: those with potash and soda are also soluble in water. One of these acids (*Ricinic acid*) is crystalline, solid at ordinary temperature, and fusible at 72° F. Its crystallized hydrate consists of *Carbon* 73·56, *Hydrogen* 9·86, and *Oxygen* 16·58. Another (*Elaïodic acid*) is a yellow-coloured liquid at 32° F.; but at many degrees below this it becomes crystalline. The third acid (*Margaritic acid*) constitutes only 0·002 of the products of saponification. It has not been detected, though it probably exists, in the distilled products. It crystallizes in pearly scales. It is distinguished from the ricinic and elaïodic acids by its high fusing point (220° F.), by its partial decomposition when submitted to distillation, and by the insolubility of the margaritate of magnesia in alcohol. The crystallized hydrate consists of *Carbon* 70·5, *Hydrogen* 10·91, *Oxygen* 18·59.

(*c.*) *Solid residuum.*—Pale yellow, elastic, gelatiniform, odourless, tasteless, combustible, solid; and is insoluble in alcohol, ether, and the oils (both fixed and volatile).

(*d.*) *Palmin.*—A solid odorous fat formed by the action of hyponitrous acid on castor oil. By saponification it yields *palmic acid* and *glycerin.*

Physiological Effects. 1. *Of Castor Seeds.*—These seeds possess considerable acridity. Bergius (*Mat. Med.* t. ii. p. 823, ed. 2nda) states that a man masticated a single seed at bed-time: the following morning he was attacked with violent vomiting and purging, which continued the whole day. Lanzoni also states that the life of a woman was endangered by eating three grains of the seeds (Marx, *Die Lehre von d. Giften.* i. 128.) More recently, a girl, 18 years of age, was killed by eating "about twenty" seeds: the cause of death was gastro-enteritis (*Lond. Med. Gaz.* vol. xix. p. 944).

2. *Of Castor Oil.* (*a.*) *On animals generally* castor oil acts as a laxative or mild purgative. Large animals, as the horse, require a pint or more for a dose; smaller ones need only a few ounces (Moiroud, *Pharm. Vétér.* p. 280). Mr. Youatt, however, declares this oil to be both uncertain and dangerous in the horse (*The Horse*, in *Libr. of Useful Knowledge*, pp. 212 & 387).

(*b.*) *On man.*—*Injected into the veins*, castor oil gripes and purges, and causes a nauseous oily taste in the mouth (Dr. E. Hale, in Begin's *Traité de Thérapeutique*, p. 114): hence it would appear to have a specific influence over the mucous lining of the alimentary canal. *Swallowed* to the extent of one or two ounces, it usually acts as a mild but tolerably certain purgative or laxative, without producing any uneasiness in the bowels. "It has this particular advantage," says Dr. Cullen (*Mat. Med.*), "that it operates sooner after its exhibition than any other purgative I know of, as it commonly operates in two or three hours. It seldom gives any griping, and its operation is generally moderate—to one, two, or three stools only." It not unfrequently occasions nausea, or even vomiting, especially if somewhat rancid; in many cases, I believe, rather from its disgusting flavour than from any positively emetic qualities.

It has been stated by continental writers that castor oil is most unequal in its action, at one time operating with considerable violence, at another with great mildness; but I have never found it so, nor is it usually considered to be so in this country. I can, however, readily believe that a difference in the mode of its preparation, especially with reference to the heat employed, may materially affect its purgative property.

When castor oil has been taken by the mouth, it may be frequently recognized in the alvine evacuations; but it presents itself under various forms, "sometimes resembling caseous flakes, or a soap-like scum, floating on the more fluid part of the dejection; occasionally it had been arranged in a form not unlike branches of grapes, or more nearly of hydatids of a white colour; more generally, however, it is found mixed up with the fæces as a kind of emulsion, and in some few instances it has been discharged under the form of solid tallow-like masses" (Mr. Golding Bird, *Lond. Med. Gaz.* vol. xv. p. 225). Mr. Brande (*Dict. of*

Mat. Med.) says in one case it was discharged from the bowels in the form of indurated nodules, which were at first regarded as biliary concretions. A remarkable case is mentioned by Dr. Ward, of a woman on whom this oil does not act as a purgative, but exudes from every part of her body (*Lond. Med. Gaz.* vol. x. p. 377).

Uses.—Castor oil is used to evacuate the contents of the bowels in all cases where we are particularly desirous of avoiding the production of abdominal irritation (especially of the bowels and the urino-genital organs). The principal, or I might say the only, objection to its use in these cases, is its nauseous taste. The following are the leading cases in which we employ it:—

1. *In inflammatory affections of the alimentary canal,* as enteritis, peritonitis, and dysentery, a mild but certain purgative is oftentimes indicated. No substance, I believe, answers the indication better, and few so well as castor oil.

2. *In obstructions and spasmodic affections of the bowels,* as intussusception, ileus, and colic, especially lead colic, this oil is the most effectual evacuant we can employ.

3. *After surgical operations about the pelvis or abdomen* (for example, lithotomy, and the operation for strangulated hernia), as well as after *parturition,* it is the best and safest purgative.

4. *In inflammatory or spasmodic diseases of the urino-genital organs,* inflammation of the kidneys or bladder, calculous affections, gonorrhœa, stricture, &c., castor oil is a most valuable purgative.

5. *In affections of the rectum,* especially piles, prolapsus, and stricture, no better evacuant can be employed.

6. *As an anthelmintic* for tape-worms, castor oil was first employed by Odier. Arnemann, however, has shown that it possesses no peculiar or specific vermifuge properties.

7. *As a purgative for children* it has been used on account of its mildness, but its unpleasant taste is a strong objection to its use.

8. *In habitual costiveness,* also, it has been recommended. Dr. Cullen observed that if castor oil be frequently repeated, the dose might be gradually diminished; so that persons who, in the first instance, required half an ounce or more, afterwards needed only two drachms.

Administration.—The dose of castor oil for children is one or two tea-spoonfuls; for adults, from one to two or three table-spoonfuls. To cover its unpleasant flavour some take it floating on spirit (especially gin), but which is frequently contra-indicated; others on coffee, or on peppermint or some other aromatic water; or it may be made into an emulsion by the aid of the yolk of egg or mucilage.

Euphor'bia, Linn.; *An undetermined species yielding Euphor'bium,* E.

Euphorbia officinarum, *L.* Euphorbia canariensis, *D.*

Sex. Syst. Dodecandria Trigynia, *Linn.*; Monœcia, Monandria, *Smith.*

(Euphorbium; gummi-resina. *L. D.* Concrete resinous juice, *E.*)

History.—The saline waxy-resin, called in the shops *gum euphorbium,* is said both by Dioscorides (lib. iii. cap. 96) and Pliny (*Hist. Nat.* lib. xxv. cap. 38, ed. Valp.) to have been first discovered in the time of Juba, king of Mauritania; that is, about, or a few years before, the commencement of the Christian æra. Pliny says that Juba called it after his physician, Euphorbus; and that he wrote a volume concerning it, which was extant in Pliny's time. Salmasius, however, states that this resin is mentioned by Meleager the poet, who lived some time before Juba.

Botany. *Gen. Char.*—*Flowers* collected in monœcious heads, surrounded by an involucrum, consisting of one leaf with five divisions, which have externally five glands alternating with them. *Males* naked, monandrous, articulated with their pedicle, surrounding the female, which is in the centre. *Females* naked, solitary. *Ovarium* stalked. *Stigmas* three, forked. *Fruit* hanging out of the involucrum, consisting of three cells, bursting at the back with elasticity, and each containing one suspended seed (Lindley).

Sp. Char.—*Branches* with four, rarely five angles, armed with double, straight, spreading, dark, shining *spines*.

These specific characters are taken from the branches found mixed with the euphorbium of commerce. They agree with the description and figure of *Tithymalus aizoides lactifluus* seu *Euphorbia canariensis* of Plukenet (*Almagest. Bot.* vol. ii. p. 370). From the *E. canariensis* of Willdenowof and some other botanists, this plant is distinguished by its straight spines. The *E. officinarum* has many angles: the *Dergmuse* of Jackson (*Account of Morocco*, 3rd ed. p. 134) has many scolloped angles. *Euphorbia antiquorum* (fig. 162) has been said to yield euphorbium, but the statement is denied by both Hamilton (*Trans. of the Linn. Soc.* vol. xiv.) and Royle (*Bot. of the Himalayan Mount.* p. 328).

Hab.—Africa, in the neighbourhood of Mogadore?

Extraction.—Euphorbium is thus procured. The inhabitants of the lower regions of the Atlas range make incisions in the branches of the plant, and from these a milky juice exudes, which is so acrid that it excoriates the fingers when applied to them. This exuded juice hardens by the heat of the sun, and forms a whitish yellow solid, which drops off in the month of September, and forms the euphorbium of commerce. "The plants," says Mr. Jackson (*op. cit.*), "produce abundantly once only in four years; but this fourth year's produce is more than all Europe can consume." The people who collect it, he adds, are obliged "to tie a cloth over their mouth and nostrils to prevent the small dusty particles from annoying them, as they produce incessant sneezing."

Properties.—Euphorbium consists of irregular, yellowish, slightly friable tears, usually pierced with one or two holes, united at the base, and in which we find the remains of a double aculeus. These tears are almost odourless; but their dust, applied to the olfactory membrane, acts as a powerful sternutatory. Their taste is at first slight, afterwards acrid and burning.

When heated, euphorbium melts, swells up imperfectly, evolves an odour somewhat like that of benzoic acid vapour, takes fire, and burns with a pale flame. Alcohol, ether, and oil of turpentine, are its best solvents; water dissolves only a small portion of it.

Composition.—Euphorbium has been the subject of several analyses; namely, in 1800, by Laudet (Gmelin, *Handb. d. Chem.*); in 1809, by Braconnot (*Ann. Chim.* lxviii. 44); in 1818, by Pelletier (*Bull. de Pharm.* iv. 502); and by Mühlmann (Gmelin, *op. cit.*); in 1819, by Brandes (*Ibid.*); and more recently by Drs. Buchner and Herberger (Christison, *Treat. on Poisons*).

Pelletier's Analysis.

Resin	60·8
Wax	14·4
Bassorin	2·0
Malate of lime	12·2
Malate of potash	1·8
Water and loss	8·8
Euphorbium	100·0

Brande's Analysis.

Resin	43·77
Wax	14·93
Caoutchouc	4·84
Malate of lime	18·82
Malate of potash	4·90
Sulphates of potash and lime, and phosphate of lime	0·70
Water and loss	6·44
Woody fibre	5·60
Euphorbium	100·00

Resin is the active ingredient of euphorbium. It coincides in many of its properties with ordinary resins: thus, it is reddish-brown, hard, brittle, fusible, soluble in alcohol, ether, and oil of turpentine, and somewhat less so in oil of almonds. Its leading and characteristic property is intense acridity. It differs from some resins in being slightly soluble only in alkalies. Drs. Buchner and Herberger consider it to be a compound of two resinous substances—one possessing the properties of an acid, the other those of a base.

Physiological Effects. (*a.*) *On animals generally.* — Euphorbium acts on horses and dogs as a powerful acrid substance, irritating and inflaming parts with which it is placed in contact, and by sympathy affecting the nervous system. When swallowed in large quantities, it causes gastro-enteritis (two ounces are sufficient to kill a horse); when applied to the skin, it acts as a rubefacient and epispastic. Farriers sometimes employ it as a substitute for cantharides, for blistering horses, but cautious and well-informed veterinarians are opposed to its use.

(*b.*) *On man.*—The leading effect of euphorbium on man is that of a most violent acrid; but under certain circumstances a narcotic operation has been observed. When *euphorbium dust is inhaled, and also applied to the face*, as in grinding this drug, it causes sneezing, redness and swelling of the face, and great irritation about the eyes and nose. To prevent as much as possible these effects, various contrivances are adopted by different drug-grinders: some employ masks with glass eyes; others apply wet sponge to the nose and face; while some cover the face with crape. The pain and irritation, I am informed, are sometimes very great. Individuals who have been exposed for some time to the influence of this dust, suffer with headache, giddiness, and ultimately become delirious. All the workmen of whom I have inquired (and they comprise those of three large firms, including the one alluded to by Dr. Christison), agree that these are the effects of euphorbium. An old labourer assured me that this substance produced in him a feeling of intoxication: and I was informed at one drug-mill of an Irish labourer who was made temporarily insane by it, and who, during the fit, insisted on saying his prayers at the tail of the mill-horse.

Insensibility and convulsions have been produced by euphorbium. The only instance, I am acquainted with, is the following:—A man was engaged at a mill where euphorbium was being ground, and remained in the room longer than was considered prudent. Suddenly he darted from the mill-room, and ran with great velocity down two pairs of stairs. On arriving at the ground-floor or yard he became insensible, and fell. Within five minutes I saw him; he was lying on his back, insensible, and convulsed; his face was red and swollen; his pulse frequent and full; and his skin very hot. I bled him, and within half an hour he became quite sensible, but complained of great headache. He had no recollection of his flight down stairs, which seems to have been performed in a fit of delirium.

When *powdered euphorbium is applied to the skin*, it causes itching, pain, and inflammation, succeeded by vesication.

When *swallowed*, it causes vomiting and purging, and, in large doses, gastro-enteritis, with irregular hurried pulse and cold perspirations.

USES.—Notwithstanding that it is still retained in the Pharmacopœia, it is rarely employed in medicine. It was formerly used as an *emetic* and *drastic purgative* in dropsies; but the violence and danger of its operation have led to its disuse. Sometimes it is employed as an *errhine* in chronic affections of the eyes, ears, or brain; but its local action is so violent that we can only apply it when largely diluted with some mild powder, as starch or flour.

Mixed with turpentine or Burgundy pitch (or rosin), it is employed in the form of plaster, as a *rubefacient*, in chronic affections of the joints. As a *vesicant*, it is rarely employed. As a *caustic*, either the powder or alcoholic tincture (*Tinctura Euphorbii*, Ph. Bor. prepared by digesting euphorbium, ℥j. in rectified spirit, Oj.) is sometimes employed in carious ulcers.

ANTIDOTE.—In a case of poisoning by euphorbium, emollient and demulcent drinks, clysters (of mucilaginous, amylaceous, or oleaginous liquids), and opium, should be exhibited, and blood-letting and warm baths employed. In fact, as we have no chemical antidote, our object is to involve the poison in demulcents, to diminish the sensibility of the living part by opium, and to obviate the inflammation by blood-letting and the warm bath.

Jan'ipha Man'ihot, Kunth, E.—*The Cassa'va* or *Tapio'ca Plant.*

Jatropha Manihot, *Linn.*

Sex Syst. Monœcia, Monadelphia.

(Fecula of the root; Tapioca, *E.*)

HISTORY.—Tapioca (Tipioca) is mentioned by Piso (*Hist. Nat. Brasiliæ*, p. 52-4) in 1648. The terms Janipha and Manihot are Indian appellations.

BOTANY. *GEN. CHAR.*—*Flowers* monœcious. *Calyx* campanulate, five-parted. *Petals* none. *Stamens* ten; filaments unequal, distinct, arranged around a disk. *Style* one. *Stigmas* three, consolidated into a rugose mass. (A. de Jussieu.)

FIG. 164.

Janipha Manihot.

SP. CHAR.—*Leaves* palmate, five to seven-parted, smooth, glaucous beneath: segments lanceolate, quite entire. *Flowers* racemose (Hooker, *Bot. Mag.* t. 3071). *Root* large, thick, tuberous, fleshy, and white; containing an acrid, milky, highly poisonous juice. *Flowers* axillary.

HAB.—Brazil.

EXTRACTION.—The tuberous root consists principally of starch and a white milky poisonous juice. It is rasped and pressed to separate the juice, which deposits a fecula: this, when washed and dried in the air without heat, is termed *Moussache* (from *mouchaco*, a Spanish word, signifying *boy* or *lad*), or *Cipipa*, and for some years past has been imported into France from Martinique, and sold as arrow-root (Guibourt, *Hist. des Drog.* t. ii. p. 466, 3me éd.) I believe it to be identical with the *Brazilian Arrow-root* of English commerce. When this fecula has been prepared by drying on hot plates, it acquires a granular character, and is then termed *Tapioca.*

The compressed pulp is dried in chimneys, exposed to the smoke, and afterwards powdered. In this state it constitutes *Cassava powder*, or *Farine de Manioc.* If it be granulated by agitating it in a heated iron pan until incipient tumefaction, it is called *Couaque* or *Couac.* Lastly, when dried or baked into cakes on plates of iron or clay, it constitutes *Cassava* or *Cassada bread.*

Properties.—1. *Granular Tapioca*, or *Tapioca* commonly so called, is imported from Bahia and Rio Janeiro. It occurs in irregular small lumps or grains, which are partially soluble in cold water, the filtered solution yielding a blue colour with iodine. When these grains are mixed with water, and examined by the microscope, they present numerous spherical granules, of nearly equal volume, and smaller than those of arrow-root, or than the average of those of wheat starch. The hilum of each granule is a small dark spot, from which three equi-distant lines radiate towards the circumference of the granule.

2. *Tapioca Meal: Brazilian Arrow-root: Moussache* or *Cipipa.*—Imported from Rio Janeiro. It is white and pulverulent. When examined by the microscope, it is readily distinguished from arrow-root fecula. Its granules are quite spherical, much smaller than those of arrow-root, and of a remarkable equality of volume (Guibourt, *op. cit.*) The granules seem identical with those of the common or granular tapioca.

Composition.—Tapioca has not been analyzed. Its composition is doubtless analogous to that of other amylaceous matters (vide pp. 593 and 679).

Chemical Characteristics.—The filtered cold infusion is coloured blue by tincture of iodine, shewing that tapioca is partially soluble in cold water. In boiling water tapioca becomes tremulous, gelatiniform, transparent, and viscous. Submitted to prolonged ebullition in a large quantity of water, it leaves an insoluble residue, which precipitates. This residue, diluted with water, and coloured with iodine, appears under the microscope to consist of mucous flocks, and to have no resemblance to the primitive integuments.

Physiological Effects. (*a.*) *Of the Recent Juice.*—The milky juice is a powerful acrid or acro-narcotic poison; and to this the root owes its poisonous properties. The symptoms which it gives rise to, when swallowed, are pain and swelling of the abdomen, vomiting, and purging, giddiness, dimness of sight, syncope, and rapid diminution of the powers of life (Sloane's *Jamaica*, vol. i. p. 131, and vol. ii. p. 363). The scrapings of the fresh root are successfully applied to ill-disposed ulcers (Wright, *Med. Plants of Jamaica*). The root is used to catch birds, which, by eating it, lose the power of flying (Martius in Wibmer, *Arzneim. u Gifte*, Bd. iii. S. 273). The poisonous principle of the root may be destroyed or dissipated by heat, fermentation, &c. Hence it is either very volatile or readily decomposable. Guibourt (*Hist. des Drog.* t. ii. p. 455, 3me éd.) says it appears to be of the nature of hydrocyanic acid.

(*b.*) OF THE FECULA (TAPIOCA) OF THE ROOT.—When the root has been deprived of its poisonous principle, it becomes highly nutritious. Of the preparations of it before referred to, the only one met with in this country is the fecula (*Tapioca*). This is both highly nutritious and easy of digestion. Its local action is emollient and demulcent.

USES.—Made into puddings, tapioca is employed as a dietetical substance. Boiled in water or milk, and flavoured with sugar, spices, or wine, according to circumstances, it is used as an agreeable, nutritious, light, easily digestible article of food for the sick and convalescent. It is devoid of all irritating and stimulating properties.

Other Medicinal Euphorbiaceæ.

Croton Pseudo-China, Schiede, (*Croton Cascarilla*, Don, Ph. L.) grows in the vicinity of Jalapa, at Actopan, and in the district of Plau del Rio, in the province of Vera Cruz, Mexico. Its bark, called *Quina blanca*, or *Copalche bark*, has been confounded with both cinchona and cascarilla barks. In 1817, a quantity of it was carried to Hamburgh as *Cascarilla de Trinidad de Cuba*. In 1827 no less than 30,000 lbs. of the same bark were sent from Liverpool to Hamburgh as genuine cinchona, but it was soon recognized to be a bark nearly allied to cascarilla, and by those on board the vessels coming from Para was declared to be *Quina, dit Copalchi.* Subsequently the minister Von Altenstein procured some of it from Mexico, under the name of *Copalche*; and in 1829 the plant yielding it was declared by Dr. Schiede to be a species of Croton, which he called Pseudo-China. Mr. Don (*Ed. New Phil. Journ.* xvi. 368) mistook it for cascarilla bark. Copalche bark, in its form, size of the quills, and general appearance, very much resembles what our druggists call Ash Cinchona bark, but its cascarilla-like flavour instantly distinguishes it.

From cascarilla bark it is distinguished by the length of the quills, their colour, and the absence of transverse cracks. (For further details consult Guibourt, *Hist. des Drog.*; and Goebel and Kunze, *Pharm. Waarenkunde*).

Jatropha Curcas is a native of South America and of Asia. Its fruit is the *nux cathartica americana*, or *nux barbadensis* of some writers. Its seeds, which are occasionally met with in the shops, are called *physic nuts* (*semina ricini majoris*, or *gros pignon d'Inde*). Pelletier and Caventou analyzed them under the name of Croton seeds (*Journ. de Pharm.* t. xv. p. 514), and extracted from them a volatile acrid acid, called *jatrophic acid.* Mr. Bennett (*Lond. Med. Gaz.* ix. 8) swallowed four seeds, and experienced a very unpleasant burning sensation in the stomach and bowels, with nausea, which, after an interval of nearly two hours, terminated in vomiting: their purgative effects followed soon afterwards, and were mild; the sickness had then nearly passed away, but the burning sensation continued for some time longer. In large doses they are energetic poisons.

The oil (*Oleum Jatrophæ Curcadis* seu *Oleum infernale*) is analogous in its properties to croton oil. It is occasionally used as a drastic purgative. In India it is used for lamps.

Euphorbia Lathyris, or *Caper Spurge*, is an indigenous biennial. It is mentioned as an officinal substance in the Paris *Codex*. Its milky juice is violently acrid. In a case of poisoning by the seeds, narcotic symptoms were also present (Christison, *Treat. on Poisons*). The oil (*Oleum Euphorbiæ Lathyridis*), extracted from the seeds, may be employed as an indigenous substitute for croton oil. The dose of it is from three to ten drops (Dierbach, *Neueste Entd. in d. Mat. Med.* S. 76, 1837).

Euphorbia Ipecacuanha is a native of the United States of America, in whose Pharmacopœia it is mentioned. It is emetic and purgative. As an emetic it is given in doses of from ten to fifteen grains (*United States Dispensatory*).

The juice of *Crozophora tinctoria* becomes, under the united influence of air and ammonia, blue. Linen impregnated with this blue dye is called *rag turnsole* (*bezetta cærulea*): it is a test for acids, which redden it, but it is not used in this country. It must not be confounded with litmus (*vide* p. 570).

ORDER 27. ARISTOLOCHIA'CEÆ, *Lindley*.—THE BIRTHWORT TRIBE.

ARISTOLOCHIEÆ, *Jussieu*.

ESSENTIAL CHARACTER.—*Flowers* hermaphrodite. *Calyx* adherent to the ovary [*i. e.* superior], monosepalous; the limb three-lobed or tubular, and irregularly dilated at the upper part; valvate in æstivation. *Stamens* definite, generally in ternary numbers, free and distinct or adherent to the style and stigma, and epigynous. *Ovary* three to six-celled; *style* short; *stigma* divided. *Capsule* or *berry* coriaceous, three to six-celled, many seeded; the *placentas* lateral. *Embryo* very small, at the base of a cartilaginous albumen. Usually climbing *herbs* or shrubs, with alternate, simple, petiolated *leaves*. (*Bot. Gall.*)

PROPERTIES.—Not important. The roots possess stimulant properties, owing to the presence of volatile oil. Some of them are acrids. Bitter extractive renders them somewhat tonic.

Aristolo'chia Serpenta'ria, Linn. L. E. D.—*The Virginian Snake-root.*

Aristolochia officinalis, *Nees and Ebermaier.*

Sex. Syst. Gynandria, Hexandria.

(Radix, *L. D.* The Root, *E.*)

HISTORY.—The first writer who distinctly mentions *Virginian snake-root*, or *snake-weed*, is Thomas Johnson, an apothecary of London, in his edition of Gerard's Herbal, published in 1633.

BOTANY. *GEN CHAR.*—*Calyx* tubular, ventricose at the base, dilated at the apex, and extended into a ligula. *Anthers* six, subsessile, inserted on the style. *Stigma* six-lobed. *Capsule* six-angled, six-celled (*Bot. Gall.*)

SP. CHAR.—*Stem* flexuous, ascending. *Leaves* cordate, acuminate, on both sides pubescent. *Peduncles* nearly radical, unifloral. Lip of the *calyx* lanceolate (*Beschr. Offic. Planzen.*)

COLLECTION and PROPERTIES.—The root is collected in Western Pennsylvania and Virginia, in Ohio, Indiana, and Kentucky (*United States Dispensat.*) It is imported in bales, usually containing about 100 lbs. As met with in the shops, it consists of a tuft of long, slender, yellowish, or brownish fibres, attached to a long contorted head or caudex. The odour is aromatic, the taste warm and bitter.

COMPOSITION.—It was analyzed by Bucholz in 1807 (Gmelin, *Handb. d. Chem.*); by Chevallier in 1820 (*Journal de Pharm.* vi. 365); and by Peschier in 1823 (Gmelin, *op. cit.*)

Bucholz's Analysis.		*Chevallier's Analysis.*
Volatile oil	0·50	Volatile oil.
Greenish-yellow soft resin	2·85	Resin.
Extractive matter	1·70	Extractive.
Gummy extractive	18·10	Starch.
Lignin	62·40	Ligneous fibre.
Water	14·45	Albumen.
		Malate and phosphate of lime.
	100·00	Oxide of iron and silver.

1. *Volatile Oil.*—Grassmann (quoted by Dr. W. C. Martius, *Pharmacogn.*) obtained only half an ounce from 100 lbs. of the root. Its colour is yellowish, its odour considerable, its taste not very strong (Lewis, *Mat. Med.*) Grassmann compares the odour and taste to those of valerian and camphor combined.

2. *Bitter Principle: Extractive*, Bucholz and Chevallier.—This is very bitter and slightly acrid. It is soluble in both water and spirit. Its solution, which is yellow, is rendered brown by alkalies, but is unchanged by the ferruginous salts,

PHYSIOLOGICAL EFFECTS.—These have been examined by Jörg and his pupils (Wibmer, *Arzneim. ü. Gifte*, Bd. i. S. 221; also, *Journ. de Chim. Méd.* t. vii. p. 493).

In *small doses*, serpentary promotes the appetite. In *large doses*, it causes nausea, flatulence, uneasy sensation at the stomach, and more frequent but not liquid stools. After its absorption, it increases the frequency and fulness of the pulse, augments the heat of the skin, and promotes secretion and exhalation. Furthermore it would appear, from the experiments before referred to, that it caused disturbance of the cerebral functions, and produces headache, sense of oppression within the skull, and disturbed sleep.

In these properties, serpentary bears some analogy to, but is much weaker than, camphor. It is more powerful than contrayerva.

USES.—Its employment is indicated in cases of torpor and atony. It was formerly termed *alexipharmic*, on account of its fancied power of curing the bite of the rattlesnake and of a mad dog (Dale, *Pharmacologia*). At the present time it is rarely employed. It has been much esteemed as a stimulant in *fevers*, both continued and intermittent. A scruple of serpentary, taken in three ounces of wine, is mentioned by Sydenham (*Works*, translated by Dr. Pechey, 4th ed. p. 233) as a cheap remedy for tertians in poor people. Dr. Cullen (*Mat. Med.*) considered it as suited for the low and advanced stage of typhus only. In an epidemical affection of the throat (called the *throat-distemper*), it was given internally as a diaphoretic, and used with sumach berries, in the form of a decoction, as a gargle, with benefit (*Med. Observ. and Inquir.* vol. i. p. 211).

ADMINISTRATION.—The dose of it in substance is from ten to thirty grains. The infusion is the best form for the administration of serpentary.

1. *INFUSUM SERPENTARIÆ*, L. E.—Serpentary, ℥ss.; Boiling Water, Oj. Infuse for four hours in a [lightly, *L.*] covered vessel, and strain [through linen or calico, *E.*] Dose, f℥j. or f℥ij. every two or three hours, according to circumstances.

2. *TINCTURA SERPENTARIÆ*, L. E. D.—Serpentary, bruised, [in moderately fine powder, *E.*], ℥iijss. *L.* [℥ij. *E.* ℥iij. *D.*]; Proof Spirit, Oij. [Oj. and ℥xvj.; Cochineal, bruised, ʒj. *E.*]. Macerate for fourteen [seven, *D.*] days, and filter. "Proceed by percolation or digestion as for the tincture of cinchona," *E.* Used as an adjunct to tonic infusions. Dose, from fʒj. to fʒij.

As'arum europæ'um, Linn. L. D.—*Common Asarabac'ca.*

Sex. Syst. Dodecandria, Monogynia.

(Folia, *L. D.*)

HISTORY.—This plant was used in medicine by the ancients. Dioscorides (lib i., cap. ix.) calls it ἄσαρον.

BOTANY. *GEN. CHAR.*—*Calyx* campanulate, three-lobed. *Stamens* twelve, inserted on the ovary: *anthers* adnate to the middle of the filaments. *Style* short. *Stigma* stellate, six-lobed. *Capsule* six-celled. (*Bot. Gall.*)

SP. CHAR.—*Leaves* two on each stem, kidney-shaped, obtuse [somewhat hairy]. (Smith, *Eng. Fl.*)

The branching *root-fibres* arise from an underground stem or *rhizome*. The aerial *stems* are several from each rhizome. *Leaves* petioled. From the axil of the two leaves springs a solitary, rather large, drooping *flower*, upon a short peduncle, of a greenish brown colour and coriaceous substance. Segment of the *calyx* incurved. *Capsule* coriaceous. *Seeds* ovate, with horny albumen.

Hab.—Indigenous. Perennial. Flowers in May.

Description.—The whole plant (root-fibres, rhizome, and aerial stems, with leaves and flowers) are kept in the shops under the name of *asarabacca* (*radix cum herba asari*), but the leaves only are directed to be used in the Phramacopœia. Dr. Batty (*Eng. Fl.*) states that the plant is gathered for medicinal uses in the woods near Kirkby Lonsdale, Westmorland. The *rhizome* is about as thick as a goose-quill, grayish, quadrangular, knotted. It has a pepper-like odour and an acrid taste. The *leaves* are almost inodorous, but have an acrid, aromatic, and bitter taste.

Composition.—Goerz (Pfaff, *Mat. Med.* Bd. iii. S. 229) published an analysis of the root in 1784; Lassaigne and Fenuelle another in 1820 *Journ. de Pharm.* t. vi. p. 561); Regimbeau a third in 1827 (*Journ. de Pharm.* t. xiv. p. 200); and Gräger a fourth in 1830 (Goebel and Kunze, *Pharm. Waarenk*).

Gräger's Analysis.

Root.

Volatile oil, Asarum-Camphor, Asarin [? Asarite]	0·630
Asarin	1·172
Tannin	1·072
Extractive	3·972
Resin	0·156
Starch	2·048
Gluten and albumen	1·010
Citric acid	0·316
Ligneous fibre	12·800
Salts, (citrates, chloride, sulphate, and phosphates)	3·042
Water	74·600
Fresh Root of Asarabacca	100·818

Herb.

Asarin	0·10
Tannin	0·04
Extractive	5·49
Chlorophylle	1·52
Albumen	2·12
Citric acid	0·54
Ligneous fibre	15·00
Water	74·84
Loss	0·35
Fresh Herb of Asarabacca	100·00

1. *Volatile Oily Matters.*—By submitting asarabacca root to distillation with water, three volatile oily matters are obtained; one liquid and two solid, at ordinary temperatures.

α. *Liquid Volatile Oil* (*Oleum Asari*). It is yellow, glutinous, lighter than water, and has an acrid, burning taste, and a penetrating valerian-like odour. It is slightly soluble in water, more so in alcohol, ether, and the oils (volatile and fixed). Its constituents are $C^8\ H^4\ O^1$.

β. *Asarite* of Gräger.—In small needles, of a silky lustre. It is odourless and tasteless. It is fusible and volatilizable by heat; its vapour being white and very irritating. It is soluble in alcohol, ether, and the volatile oils, but not in water. Both nitric and sulphuric acids dissolve the crystals without the evolution of gas: if water be added to the sulphuric solution, the asarite is thrown down unchanged.

γ. *Asarum-camphor.*—Is distinguished from asarite by the following characters:—Water throws it down from its alcoholic solution in cubes or six-sided prisms, whereas asarite is precipitated in delicate flexible needles. It dissolves in nitric acid without effervescence. Water added to its sulphuric solution throws down a brown resin. After fusion it has the form of a crystalline, striated mass. Its composition is $C^8\ H^5\ O^2$. Blanchet and Sell regard it as the hydrate of the liquid volatile oil.

2. *Bitter principle of Asarabacca* (*Asarin* of Gräger and of some other pharmacologists).—Brownish, very bitter, soluble in alcohol.

Physiological Effects.—Every part of the plant possesses acrid properties. Applied to the mucous membrane of the nose, it excites sneezing, increased secretion of the mucus, and even a discharge of blood. Swallowed, it causes vomiting, purging, and griping pains. It is said also to possess diuretic and diaphoretic properties. Dr. Cullen has enumerated it in his list of diuretics, but expresses his doubts whether it possesses any specific power of stimulating the renal vessels.

Uses.—Asarabacca has been employed in medicine to excite vomiting, and as an errhine. As an emetic, it is now superseded by ipecacuanha and tartarized antimony. As an errhine, to excite irritation and a discharge of mucus from the nasal membrane, it has been used in certain affections of the brain, eyes, face, mouth, and throat, on the principle of counter-irritation: thus, in paralytic affections of the mouth and tongue, in toothache, and in ophthalmia.

Administration.—We may administer either the root or leaves, recollecting that the latter are somewhat milder than the former. As an *emetic*, the dose is half a drachm to a drachm. As an *errhine*, one or two grains of the root, or three or four grains of the dried leaves, are snuffed up the nostrils every night. The powder of this plant is supposed to form the basis of *cephalic snuff*.

Pulvis Asari Compositus, D.—(Asarabacca leaves, dried, ℥i.; Lavender flowers, dried, ʒi. Reduce them together to powder). Used as an errhine, in headache and ophthalmia. Dose, from grs. v. to grs. viii.

Other Medicinal Aristolochiaceæ.

The roots of *Aristolochia longa* and *A. rotunda* are found in the shops. *The long aristolochia root* is several inches in length, one or two inches broad, and has a more or less cylindrical form. *The round aristolochia root* has a more rounded and knobby form. Both kinds are bitter and acrid, and have, especially when powdered, a disagreeable odour. They contain extractive matter and starch. Lassaigne found ulmin in the long species. Their effects are stimulant and tonic. Their stimulant effects are supposed by some to be principally directed to the abdominal and pelvic viscera. They have been employed in amenorrhœa as an emmenagogue. Their dose is from ℈i. to ʒi. Round aristolochia root is a constituent of the *Duke of Portland's powder for the gout*, which consisted of "equal quantities of the roots of *Gentian*, and Birthwort (*Aristolochia rotunda*), the tops and leaves of Germander (*Chamædrys*), Ground Pine (*Chamæpitys*), and lesser Centaury (*Chironea Centaurium*), powdered and mixed together" (Paris's *Pharmacologia*).

Order 28. Laura'ceæ, *Lindley*.—The Cinnamon Tribe.

Lauri, *Jussieu*.—Laurinæ, *Vent.* and *Rob. Brown*.

Essential Character.—*Calyx* four to six-cleft, with imbricated æstivation, the limb sometimes obsolete. *Stamens* definite, perigynous opposite the segments of the calyx, and usually twice as numerous; the three innermost, which are opposite the three inner segments of the calyx, sterile or deficient; the six outermost scarcely ever abortive; *anthers* adnate, two to four-celled; the cells bursting by a longitudinal persistent valve from the base to the apex; the outer anthers valved inwards, the inner valved outwards [or both valved inwards, *Lindl.*] *Glands* usually present at the base of the inner filaments. *Ovary* single, superior, with one or two single pendulous ovules; *style* simple; *stigma* obtuse. *Fruit* baccate or drupaceous, naked, or covered. *Seed* without albumen; *embryo* inverted; *cotyledons* large, plano-convex, peltate near the base!; *radicle* very short, included, superior; *plumule* conspicuous, two-leaved.—*Trees*, often of great size. *Leaves* without stipules, alternate, seldom opposite, entire, or very nearly lobed. *Inflorescence* panicled or umbelled (Rob. Brown).

Properties.—The plants of this order owe their most important qualities to the presence of volatile oil, which is found, more or less abundantly, in all parts of the vegetable. This oil is sometimes liquid and highly aromatic, as oil of cinnamon: at others it is solid at ordinary temperatures, and is endowed with narcotic properties, as camphor. The acrid principle of some species is probably a volatile oil.

In the bark and leaves, the volatile oil is usually associated with tannic acid, which gives them astringency, as in cinnamon. In the fruit and seeds, on the other hand, it is usually combined or mixed with fixed oil, as in bay-berries.

Cinnamo'mum zeylan'icum, Nees, E.—*The Cinnamon.*

Laurus Cinnamomum, *Linn. L. D.*

Sex. Syst. Enneandria, Monogynia.

(Cortex; et Oleum e cortice destillatum, *L.*—Bark; and Volatile oil of the bark, *E.*—Cortex et Oleum volatile, *D.*)

HISTORY.—Cinnamon (*Kinman*, Hebr.) is mentioned in the Old Testament (*Exod.* xxx. 23), about 1490 years before Christ. In all probability the Hebrews received it from the Arabians, who must, therefore, have had commercial dealings with India at this early period (*Pictorial Bible*, vol. i. p. 222). The first notice of cinnamon (κιννάμωμον) by the Greek writers occurs in Herodotus (*Thalia*, cvii. & cxi.), who died 413 years before Christ. Probably both the Hebrew and Greek names for this bark are derived from the Cingalese *cacyn-nama* (*dulce lignum*), or the Malayan *kaimanis* (Royle, *Essay on Hindoo Medicine*, pp. 84 & 141). Hippocrates (pp. 265, 575, & 609, ed. Fæs.) employed cinnamon externally. Dioscorides (lib. i. cap. 13) describes several kinds of cinnamon.

BOTANY. *GEN. CHAR.*—*Flowers* hermaphrodite or polygamous. *Calyx* six-cleft; with the limb deciduous. *Stamina* twelve, in four rows; the nine external ones fertile, the three inner ones capitate, abortive; the three most internal of the fertile stamina having two sessile glands at the base: *anthers* four-celled, the three inner turned outwards. *Ovary* one-celled, with one ovule. *Fruit* (a berry) seated in a cup-like calyx. *Leaves* ribbed. *Leaf-buds* naked. *Flowers* panicled, rarely fascicled. (Condensed from Endlicher, *Gen. Plant.*)

SP. CHAR.—*Branches* somewhat four-cornered, smooth. *Leaves* ovate or ovate-oblong, tapering into an obtuse point, triple-nerved, or three-nerved, reticulated on the under side, smooth, the uppermost the smallest. *Panicles* terminal and axillary, stalked. *Flowers* hoary and silky; segments oblong, deciduous in the middle (Nees, *Laurin.*)

Botanists admit several varieties of this species: the most important are,—

α. *Broad-leaved*, Moon *Cat. of* (*Ceylon Plants*): *Mū-pat* (Cingalese). The plant above described.

FIG. 165.

Cinnamomum zeylanicum.

β. *Narrow-leaved*, Moon. *Cinnamomum zeylanicum* var. *Cassia*, Nees. *Heen-pat* (Cingalese). This variety which I have received from Ceylon, under the name of *Bastard Cinnamon*, has oblong or elliptical leaves, much tapering to the point, and acute at the base.

Percival (*Account of the Island of Ceylon*) mentions four varieties which are barked: 1st, *Rasse curundu*, or *honey cinnamon*, with broad leaves, yields the best bark; 2dly, *Nai curundu*, or *snake cinnamon*, also with large leaves not greatly inferior in quality to the former; 3dly, *Capuru curundu*, or *camphor cinnamon*, are inferior species; 4thly, *cabatte curundu*, or *astringent cinnamon*, with smaller leaves; its bark has a harsh taste.

Hab.—Cultivated in Ceylon and Java.

Production.—The cinnamon bark of Ceylon is obtained by the cultivation of the plant. The principal *cinnamon gardens* lie in the neighbourhood of Columbo, (see a figure of one in Percival's *Account of Ceylon*, 2d ed. 1805). The bark-peelers, or *choliahs*, having selected a tree of the best quality, lop off such branches are three years old, and which appear proper for the purpose. Shoots or branches, much less than half an inch or more than two or three inches in diameter, are not peeled. The peeling is effected by making two opposite, or when the branch is thick three or four, longitudinal incisions, and then elevating the bark by introducing the peeling-knife beneath it. When the bark adheres firmly, its separation is promoted by friction with the handle of the knife. In twenty-four hours the epidermis and greenish-pulpy matter (rete mucosum) are carefully scraped off. In a few hours the smaller quills are introduced into the larger ones, and in this way a congeries of quills formed, often measuring forty inches long. The bark is then dried in the sun, and afterwards made into bundles with pieces of split bamboo twigs (Percival, *op. cit.*; and Marshall, in *Thomson's Ann. of Philosophy*, vol. x.)

Commerce.—Cinnamon is imported in bales, boxes, and chests, from Ceylon principally; but in part also from Madras, Tellicherry, and rarely from Canton (*Trade List* for 1837 and 1838). In 1830, 14,345 lbs.; and in 1831, 2305 lbs. of cinnamon were imported from the Cape of Good Hope (*Parliamentary Returns*). The quantities of cinnamon on which the import duty of 6d. per lb. was paid, during the last four years, are the following (*Trade List*):—

In 1835	16,255 lbs.	In 1837	13,697 lbs.
1836	17,398 lbs.	1838	16,605 lbs.

Cinnamon exported from the island of Ceylon is subject to the exorbitant duty of 3s. per lb. This has been put on as a substitute for the previous monopoly in the cultivation and sale of cinnamon, held by the government (M'Culloch, *Commerc. Diction.*)

A few years ago it was the practice to sprinkle black pepper among the bales of cinnamon in stowing them, in order to preserve and improve the quality of the bark (Percival, *op. cit.*, and Marshall, *loc. cit.*) But better experience has shewn that no advantage attends the practice, which, therefore, is now almost entirely discontinued; indeed, some persons are of opinion that it is injurious.

Description.—*Ceylon Cinnamon* (*Cinnamomum zeylanicum* seu *Cinnamomum acutum*) is imported in bundles weighing about 1 ℔ each, and tied with pieces of split bamboo twigs. The fasciculi, or compound quills, are about three feet long, slender, and shivery, and are composed of several smaller quills inclosed one within the other. The bark is thin (the finest being scarcely thicker than drawing paper), smooth, of a light yellowish-brown, or brownish-yellow (somewhat similar to that of Venetian gold), smooth, moderately pliable, with a splintery fracture, especially in the longitudinal direction. The inner side or *liber* is darker and browner, and contains, according to Nees, small medullary rays filled with a red juice, and which he regards as the peculiar bearers of the aroma. The odour of the bark is highly fragrant. The flavour is warm, sweetish, and agreeable. Inspection and tasting are the methods resorted to for ascertaining the quality of cinnamon (Percival, and Marshall, *op. cit.*) Inferior kinds are thicker, darker, browner, and have a pungent, succeeded by a bitter, taste. In the London market three qualities of cinnamon are distinguished, viz. *first*, *seconds*, and *thirds*.

Tellicherry or *Bombay Cinnamon* is grown on one estate only, at Tellicherry, by Mr. Brown, and is wholly consigned to Messrs. Forbes and Co. It is inferior to Ceylon cinnamon, but superior to the Malabar variety.

Madras or *Malabar Cinnamon* is of inferior quality. It is grown in the neighbourhood of Madras.

Cayenne Cinnamon is obtained by cultivation at Cayenne. Its volatile oil is more acrid and peppery than the oil from the Ceylon cinnamon (Vauquelin, *Journ. de Pharm.* t. iii. p. 434).

COMPOSITION.—In 1817, Vauquelin (*Ibid.* p. 433) made a comparative analysis of the cinnamons of Ceylon and Cayenne. The constituents of both were found to be *volatile oil*, *tannin*, *mucilage*, *colouring matter* (partially soluble in water and in alcohol, but insoluble in ether), *resin*, *an acid*, and *ligneous fibre*.

1. *Oil of Cinnamon bark* (*Oleum Cinnamomi veri*, offic.) is obtained in Ceylon, by macerating the inferior pieces of the bark, reduced to a gross powder, in sea-water for two days, when both are submitted to distillation. As imported the oil varies somewhat in its colour from yellow to red; the paler varieties are the most esteemed: hence London druggists frequently submit the red oil of cinnamon to distillation, by which they procure two pale yellow oils; one lighter (amounting to about a quarter of the whole), the other heavier, than water. The loss on this process is considerable, being near 10 per cent. Percival (*op. cit.*) says that the oil obtained from the finer sorts of cinnamon is of a beautiful gold colour, while that from the coarser bark is darker and brownish. It is somewhat remarkable, therefore, that the Edinburgh College should give, as the characteristic of good oil of cinnamon, a "cherry red" colour—a character which applies to oil of inferior quality, or to oil which has undergone change by keeping. Its odour is "purely cinnamomic" (*Ph. Ed.*) Its taste is at first sweetish, afterwards cinnamomic, burning, and acrid. The oil of commerce sinks in water; it is probably a mixture of the heavy and light oils. It possesses basic properties, for it combines with acids to form crystalline salts. "Nitric acid converts it nearly into a uniform crystalline mass" (*Ph. Ed.*) This solidification is usually accompanied with or followed by an intense red colour, owing to the formation of resin. The crystalline compound is a *nitrate of the oil of cinnamon.* The composition of oil of cinnamon is, according to Mulder (*Berl. Jahrb.* Bd. xxxviii. S. 176) $C^{20} H^{11} O^2$. This formula differs from those previously given by Dumas and Peligot, and by Blanchet (Thomson's *Organ. Chemistry*), but it is the result of 19 analyses, and is probably more correct. In old oil of cinnamon, crystals of *cinnamic acid* (composed of $C^{18} H^7 O^3$) are sometimes deposited; at the same time a resin is formed, to which the deep colour of the oil is owing (Mulder, *op. cit.*) Hence the formation of cinnamic acid does not depend on the mere oxidation of the oil, as MM. Dumas and Peligot had imagined. The last-mentioned chemists regard oil of cinnamon as a *hydret of cinnamyle* (cinnamyle is a supposititious base assumed to consist of $C^{18} H^7 O^2$). Mulder, however, considers the oil to be a compound of one equivalent of *benzoyle* ($C^{14} H^5 O^2$), and six equivalents of *carburetted hydrogen* (6 CH).

Oil of Cinnamon leaf has been recently imported. I am informed by a gentleman, on whose estate in Ceylon it was obtained, that it is procured by macerating the leaves in sea-water, and afterwards submitting both to distillation. It is a yellow liquid, heavier than water, and has an odour and taste analogous to those of oil of cloves.

2. *Tannic acid.*—This is a constituent of cinnamon bark. Vauquelin (*op. cit.* p. 436) says it is in combination with a vegeto-animal matter.

CHEMICAL CHARACTERISTICS.—Sesquichloride of iron causes a greenish flocculent precipitate (*tannate of iron*) in infusion of cinnamon. Solution of gelatin also occasions a precipitate (*tannate of gelatin*) in the infusion.

PHYSIOLOGICAL EFFECTS.— Cinnamon produces the effects of the spices already described (p. 72). *In moderate doses* it stimulates the stomach, produces a sensation of warmth in the epigastric region, and promotes the assimilative functions. The repeated use of it disposes to costiveness.

In full doses it acts as a general stimulant to the vascular and nervous systems. Some writers regard it as acting specifically on the uterus (Sundelin, *Heilmittell.* Bd. ii. S. 199, 3ᵗᵉ Aufl.; and Wibmer, *Wirk. d. Arzn. ü. Gifte.* Bd. ii. S. 137).

USES.—The uses of cinnamon are those of the spices generally, and which have been before noticed (p. 72). It is employed by the cook as an agreeable condiment. In medicine, it is frequently added to other substances; as, to the bitter infusions, to improve their flavour; and to purgatives, to check their griping qualities. As a cordial, stimulant, and tonic, it is indicated in all cases characterized by feebleness and atony. As an astringent, it is employed in diarrhœa, usually in combination with chalk, the vegetable infusions, or opium. As a cordial and stimulant, it is exhibited in the latter stages of low fever. In flatulent and spasmodic affections of the alimentary canal, it often proves a very efficient carminative and antispasmodic. It checks nausea and vomiting. It has also been used in uterine hemorrhage.

ADMINISTRATION.—The dose of it in substance is from ten grains to half a drachm.

1. *PULVIS CINNAMOMI COMPOSITUS*, L.—(Cinnamon, ℥ii.; Cardamom, ʒiss.; Ginger, ʒi.; Long Pepper, ʒss. Rub them together, so that a very fine powder may be made.) Aromatic and carminative. Dose, gr. x. to gr. xxx. Principally employed as a corrigent of other preparations.

2. *AQUA CINNAMOMI*, L. E. D.—(Cinnamon, bruised, lb. iss. [℥xviij. *E.*, lbj. *D.*; or Oil of Cinnamon, ʒij. *L.*]; Proof Spirit, f℥vij. [Rectified Spirit, f℥iij. *E.* No Spirit, *D.*]; Water, *Cong*. ij. [as much as may be sufficient to prevent empyreuma, *D.*] Let a gallon distil. *The Dublin College* macerates the bark in the water for one day previous to distillation). This water is usually prepared in the shops, by diffusing the oil through water by the aid of sugar or of carbonate of magnesia. According to a formula given in the London Pharmacopœia, ʒj. of oil is to be carefully triturated with ʒi. of carbonate of magnesia, and afterwards with Oiv. of distilled water, and the water subsequently filtered. Cinnamon water is principally employed as a vehicle for other medicines. It is aromatic and carminative. Gœppert says it is poisonous to plants. By dissolving iodine and iodide of potassium in cinnamon water, a crystalline compound is produced, consisting of iodide of potassium 12·55, iodine 28·14, oil of cinnamon 59·31 (Apjohn, *Athenæum*, No. 517, for 1837, and No. 559, 1838.)

3. *TINCTURA CINNAMOMI*, L. E. D.—(Cinnamon, bruised, ℥iijss. [in moderately fine powder, ℥iij. and ʒiij. *E.*]; Proof Spirit, Oii. Macerate for fourteen days, and strain. [Proceed by percolation or digestion, as directed for tincture of cassia, *E.*]). Commonly used as an adjuvant to cretaceous, astringent, tonic, or purgative mixtures. It has also been employed in uterine hemorrhage (Voigtel, *Arzneim.* Bd. ii. S. 465.) Dose, ʒi. to fʒiv.

4. *TINCTURA CINNAMOMI COMPOSITA*, L. E.—(Cinnamon, bruised [in fine powder, if percolation be followed, *E.*] ℥j.; Cardamom, bruised, ʒss.

[℥j. *E.*]; Long Pepper, powdered [ground finely, *E.*], ʒijss. [ʒiij. *E.*]; Ginger, ʒijss. [not used by the *Ed.* College]; Proof Spirit, Oij. [Oj. and f℥xvj. *E.*] Macerate for fourteen days, and strain, *L.* "This tincture is best prepared by the method of percolation, as directed for the compound tincture of cardamom. But it may also be made in the ordinary way by digestion for seven days, straining and expressing the liquor, and then filtering it," *E.*) Cordial and aromatic. Used in the same cases as the last. Dose, fʒj. to fʒij.

5. *Oleum Cinnamomi*, L. E. D. (Imported from Ceylon; sometimes redrawn in this country).—The chemical properties and composition of this oil have been before noticed. It is sometimes employed as a powerful stimulant in paralysis of the tongue, in syncope, or in cramp of the stomach. But its principal use is as an adjuvant to other medicines. The dose of it is from one to two or three minims.

6. *Spiritus Cinnamomi*, L. E. D.—(Oil of Cinnamon, ʒij.; Proof Spirit, *Cong.* j.; Water, Oj. Mix them; then with a slow fire let a gallon distil, *L.*—Cinnamon, in coarse powder, lb. j.; Proof Spirit, Ovij. Macerate for two days in a covered vessel: add a pint and a half of water; and distil off seven pints, *E.*—Cinnamon bark, bruised, lb. j.; Proof Spirit, *Cong.* j.; Water sufficient to prevent empyreuma. Macerate for twenty-four hours, and distil a gallon, *D.*) Stimulant. Dose, fʒj. to fʒiv.

Cinnamo'mum Cas'sia, Blume, *E.*—*The Cin'namon Cas'sia.*

Cinnamomum aromaticum, *Nees*; Laurus Cassia, *D.*

Sex. Syst. Enneandria, Monogynia.

(Cassia-bark. Oil of Cassia, *E.*—Laurus Cassia. Cortex, *D.*—Cassia lignea, and Cassia buds, *offic.*)

History.—It is highly probable that the bark, now called *cassia-lignea*, was known to the ancient Greeks and Romans; but we cannot positively prove this. The barks termed by the ancients cinnamomum (κιννάμωμον) and cassia (κάσσια), as well as the trees yielding these substances, are too imperfectly described to enable us to determine with precision the substances referred to.

Botany. *Gen. Char.*—Vide Cinnamomum zeylanicum.

Sp. Char.—*Leaves* opposite, sometimes alternate, oblong-lanceolate, triple-nerved; the nerves vanishing at the point of the leaf. *Petioles* and younger *branches* silky-tomentose. *Stem* arborescent (Blume, *Bijdrag*).

Hab.—China; Ceylon. Cultivated in Java.

Some doubt has been entertained whether the *cassia-lignea* of commerce be obtained from this species or from some other. Mr. Marshall declares (*Ann. of Phil.* vol. x. 1817) that in Ceylon the Laurus Cassia is never decorticated, and that the coarse cinnamon (*i. e.* cinnamon procured from thick shoots or large branches of Laurus Cinnamon) "has been imported into England, and sold under the denomination of cassia." It has been erroneously inferred from this statement that the cassia-lignea of European commerce was merely coarse cinnamon; but if this were the case, it would be somewhat remarkable that cassia-lignea is not imported from Ceylon—a fact which I have ascertained by an examination of the bills of entry for the last three years. The non-decortication of Laurus Cassia in Ceylon may arise from the greater profit attending the decortication of Laurus Cinnamomum. It is not at all improbable that coarse Ceylon cinnamon may have been sold in the London market as cassia-lignea; but this by no means establishes the identity of the two barks. Such an occurrence can now scarcely happen, seeing that all cinnamon (coarse as well as fine) exported from Ceylon pays a duty of 3*s*. per lb., while the value here of cassia-lignea in bond is about 6*d*. per lb.

Description.—*Cassia-lignea* resembles cinnamon in many of its qualities. It is made up into bundles like the latter, and has the same general appearance, smell, and taste; but its substance is thicker, its appearance coarser, its colour darker, browner, and duller; its flavour, though cinnamomic, is much less sweet and fine than that of Ceylon cinnamon, but is more pungent, and is followed by a bitter taste; it is less closely quilled, and breaks shorter than genuine cinnamon.

China cassia-lignea (sometimes called *China cinnamon*) is the best kind. It is usually imported from Singapore, rarely from Canton direct. Mr. Reeves (*Trans. Med.-Bot. Society*, for 1828, p. 26) says vast quantities both of cassia seeds [buds?] and cassia-lignea are annually brought to Canton from the province of Kwangse, whose principal city (*Kweihin*, literally Cassia Forest) derives its name from the forests of cassia around it. The Chinese themselves use a much thicker bark, unfit for the European market. *Malabar cassia-lignea* is brought from Bombay. It is thicker and coarser than that of China, and is more subject to foul packing; hence each bundle requires separate inspection (Milburn's *Orient. Comm.*) *Mauritius cassia-lignea* I am unacquainted with. *Manilla cassia-lignea*, I am informed, is usually sold in bond for continental consumption.

Cassia buds (*Flores Cassiæ immaturæ*; *Clavelli cinnamomi*) are not contained in any of the British Pharmacopœias. They are the produce of China, and are probably procured from the same plant which yields cassia-lignea. Dr. T. W. C. Martius (*Pharmacognosie*, S. 210) says, that "according to the latest observations which the elder Nees has made known, cassia buds are the calyces (*Fruchtkelche*) of *Cinnamomum aromaticum*, about one-fourth of their normal size. It is also said that they are collected from *Cinnamomum dulce* Nees, which is found in China." Cassia buds bear some resemblance to cloves, but are smaller, or to nails with round heads; they have the odour and flavour of cassia-lignea or cinnamon. The exports from Canton in 1831 were 177,866 lbs., and the imports into Great Britain in 1832 were 75,173 lbs. (M'Culloch's *Dict. of Comm.*) Cassia buds have not been analyzed; their constituents are similar to those of cassia-lignea; they yield a volatile oil by distillation, and contain tannic acid.

Commerce.—The quantity of cassia-lignea annually imported, and the countries from which it is brought, are as follows (*Parliam. Returns*, No. 50, Sess. 1829; No. 367, Sess. 1832; No. 550, Sess. 1833):—

	1827.	1830.	1831.
	lbs.	*lbs.*	*lbs.*
East India Company's territories and Ceylon	408,192	799,715	358,413
Mauritius	4,117	5,995	——
Philippine Islands	3,393	25,586	34,376
Brazil	——	6,290	——
Netherlands	——	——	5,379
Cape of Good Hope	——	——	252
Total	415,702	837,586	398,420

In 1838, duty (6*d*. per ℔.) was paid on 88,971 ℔s. (*Trade List*). Cassia-lignea is imported in chests, bales, and boxes.

Composition.—*Cassia-lignea* was analyzed by Bucholz (Gmelin, *Handb. d. Chem.*), who obtained the following results:—*Volatile oil* 0·8, *resin* 4·0, *gummy* (*astringent*) *extractive* 14·6, *woody fibre with bassorin* 64·3, *water* and loss 16·3.

1. *Volatile Oil of Cassia* (*Oleum Cassiæ*, E.)—It is procured from cassia-lignea. Its mode of preparation, properties, and composition, are analogous to those of oil of cinnamon. Its odour and flavour are much inferior to those of the latter. Its colour is pale yellow. Nitric acid converts it nearly into a uniform crystalline mass. It would appear that the oil which Dumas and Peligot (*Ann. de Chim. et de Phys.* lvii. 308) examined as oil of cinnamon, was, in fact, oil of Chinese cassia.

2. *Resin.*—Is peculiar, tasteless, yellowish-brown, soft (Bucholz).

3. *Tannic Acid.*—Must have been contained in what Bucholz termed gummy (astringent) extractive.

Chemical Characteristics.—Sesquichloride of iron renders infusion of cassia-lignea dark green, and causes a precipitate (*tannate of iron*). Gelatin also produces a precipitate (*tannate of gelatin*).

Physiological Effects.—Similar to those of cinnamon. Sundelin (*Heilmittell.* Bd. ii. S. 199, 3tte Aufl.) regards it as being more astringent.

Uses.—Are the same as those of cinnamon.

Administration.—Dose, gr. x. to ʒss.

1. *Aqua Cassiæ*, E.—(Cassia-bark, bruised, ℥xviii.; Water, *Cong.* ii.; Rectified Spirit, f℥iii. Mix them together, and distil off one gallon). Used as an aromatic vehicle for other medicines. It is usually prepared from the oil in the same way that cinnamon water is commonly made.

2. *Spiritus Cassiæ*, E.—(Cassia, in coarse powder, lb. i.; Proof Spirit, Ovij. Macerate for two days in a covered vessel; add a pint and a half of water, and distil off seven pints). Dose, fʒi. to fʒiv. It is usually prepared by adding oil of cassia to proof spirit.

3. *Tinctura Cassiæ*, E.—(Cassia, in moderately fine powder, ℥iij & ʒiij.; Proof Spirit, Oij. Digest for seven days, strain, express the residuum strongly, and filter. This tincture is more conveniently made by the process of percolation, the cassia being allowed to macerate in a little of the spirit for twelve hours before being put into the percolator). Dose, fʒi. to fʒii. Used as an adjuvant to tonic infusions.

4. *Oleum Cassiæ*, E.—(Prepared by distillation from the cassia lignea). Dose, gtt. i. to gtt. iv. Employed in the same cases as oil of cinnamon. Principally used in the preparation of *aqua cassiæ* and *spiritus cassiæ*.

Cam'phora officina'rum, Nees, E.—*The Camphor Tree.*

Laurus Camphora, *Linn. L. D.*

Sex. Syst. Enneandria, Monogynia.

(Concretum sui generis sublimatione purificatum, *L.*—Camphor, *E.*—Camphora, *D.*)

History.—The ancient Greeks and Romans do not appear to have been acquainted with camphor. C. Bauhin and several subsequent writers state that Aëtius speaks of it; but I have been unable to find any notice of it in his writings; and others (Alston, *Lect. on the Mat. Med.* vol. ii. p. 406) have been equally unsuccessful in their search for it. Avicenna (lib. ii. tract. ii. cap. 134) and Serapion (*De temp. Simpl.* cccxxxiv.) speak of it: the latter calls it *kaphor*, and erroneously cites Dioscorides. Simeon Seth (*De aliment. facult.*), who lived in the 11th century, describes it; and his description is considered, both by Voigtel (*Arzneim.* Bd. i. S. 80) and by Sprengel (*Hist. de la Méd.* t. ii. p. 238) to be the earliest on record.

Botany. *Gen. Char.*—*Flowers* hermaphrodite, panicled, naked. *Calyx* six-cleft, papery, with a deciduous limb. *Fertile stamens* nine, in three rows; the inner with two, stalked, compressed glands at the base; *anthers* four-celled, the outer turned inwards, the inner outwards. Three *sterile stamens*, shaped like the first, placed in a whorl alternating with the stamens of the second row; three others stalked, with an ovate, glandular head. *Fruit* placed on the obconical base of the calyx.—*Leaves* triple-nerved, glandular in the axils of the principal veins. *Leaf-buds* scaly (Lindley).

SP. CHAR.—*Leaves* triple-nerved, shining above, glandular in the axils of the veins. *Panicles* axillary and terminal, corymbose, naked. *Flowers* smooth on the outside (Nees).

FIG. 166.

Camphora officinarum.

Young *branches* yellow and smooth. *Leaves* evergreen, oval, acuminate, attenuate at the base, bright green and shining above, paler beneath. *Petioles* from one inch to one and a half inches long. *Panicles* axillary and terminal, corymbose. *Flowers* small, yellowish-white. *Berry* round, blackish-red, size of a black currant. *Seed* solitary.

Every part of the tree, but especially the flower, evinces by its smell and taste that it is strongly impregnated with camphor.

HAB.—China, Japan, and Cochin-China. Introduced into Java from Japan.

EXTRACTION.—Kæmpfer (*Amæn. Exot.* p. 772) and Thunberg (*Fl. Japonica*) have described the method of extracting camphor in the provinces of Satzuma and the islands of Gotho in Japan. The roots and wood of the tree, chopped up, are boiled with water in an iron vessel, to which an earthen head, containing straw, is adapted. The camphor sublimes and condenses on the straw.

The method practised in China appears, from the statements of the Abbé Grosier (*Hist. Gén. de la Chine*, t. xiii. p. 335), Dentrecolles (quoted by Davies), and Davies (*The Chinese*, vol. ii. p. 355, 1836), to be somewhat different. The chopped branches are steeped in water, and afterwards boiled, until the camphor begins to adhere to the stick used in stirring. The liquid is then strained, and, by standing, the camphor concretes. Alternate layers of a dry earth, finely powdered, and of this camphor, are then placed in a copper basin, to which another inverted one is luted, and sublimation effected.

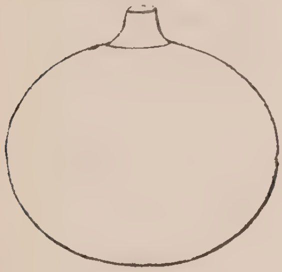
Two kinds of *unrefined* or *crude camphor* (*camphora cruda*) are known in commerce:—

1. *Dutch Camphor; Japan Camphor.*—This is brought from Batavia, and is said to be the produce of Japan. It is imported in tubs (hence it is called *tub camphor*) covered by matting, and each surrounded by a second tub, secured on the outside by hoops of twisted cane. Each tub contains from 1 cwt. to 1¼ cwts. or more. It consists of pinkish grains, which, by their mutual adhesion, form various-sized masses. It differs from the ordinary crude camphor in having larger grains, in being cleaner, and in subliming (usually) at a lower temperature. In consequence of these properties it generally fetches 10*s.* per cwt. more. There is not much brought to England, and of that which does come the greater part is re-shipped for the continent.

2. *Ordinary Crude Camphor*; *China Camphor*; *Formosa Camphor*.—This is imported from Singapore, Bombay, &c. in square chests lined with lead foil, and containing from $1\frac{1}{4}$ to $1\frac{1}{2}$ cwts. It is chiefly produced in the island of Formosa, and is brought by the Chin-Chew junks in very large quantities to Canton, whence foreign markets get supplied (Reeves, *Trans. Med. Bot. Soc.* for 1828, p. 26: Gutzlaff and Reed, *China Opened*, vol. ii. p. 84, 1838). It consists of dirty greyish grains, which are smaller than those of Dutch camphor. Its quality varies: sometimes it is wet and impure; but occasionally it is as fine as the Dutch kind.

PURIFICATION.—Crude camphor is refined by sublimation. Formerly this process was carried on only at Venice. Afterwards it was successfully practised in Holland. The method at present adopted in this metropolis is as follows:—The vessels in which this sublimation is effected are called *bomboloes* (bombola, *Ital.* βομβυλιός). They are made of thin flint glass, and weigh about 1 lb. each. Their shape is that of an oblate spheroid, whose shorter or vertical axis is about ten inches, and the longer or horizontal axis about twelve inches. They are furnished with a short neck. When filled with crude camphor, they are imbedded in the sand-bath, and heated. To the melted camphor, lime is added, and the heat raised so as to make the liquid boil. The vapour condenses on the upper part of the vessel. As the sublimation proceeds, the height of the sand around the vessel is diminished. In about forty-eight hours the process is usually completed. The vessels are then removed, and their mouths closed with tow; water is sprinkled over them by watering-pots, by which they are cracked. When quite cold, the cake of camphor (which weighs about eleven pounds) is removed, and trimmed by paring and scraping. In this process the lime retains the impurities and a portion of the camphor; hence, to extract the latter, the lime is submitted to a strong heat in an iron pot with a head to it, and the sublimed product refined by a second sublimation.

FIG. 167.



Bombolo.

PROPERTIES.—*Refined Camphor* (*Camphora raffinata*; *Camphora*, officin.) is met with in the form of large hemispherical or convex-concave cakes, perforated in the middle. It is translucent, has a crystalline granular nature, a strong, peculiar, not disagreeable, aromatic odour, and an aromatic, bitter, afterwards cooling, taste. It is solid at ordinary temperatures, soft, and somewhat tough; but may be readily powdered by the addition of a few drops of rectified spirit. A crystal of native camphor in the wood (? camphor of *Dryobalanops aromatica*, Gærtn.) in the collection of Materia Medica at the College of Physicians, appears as a flat octahedron, but its primary form is a right rhombic prism (W. Phillips, in Paris's *Pharmacologia*). It evaporates in the air at ordinary temperatures; but in closed vessels, exposed to light, sublimes and crystallizes on the sides of the bottle. It fuses at 347° F., and forms a transparent liquid, which boils at 400° F., and in close vessels condenses unchanged. It is combustible in the air, burning with a very sooty flame. It is lighter than water, its sp. gr. being 0·9857. Small pieces rotate when thrown on this liquid. Water dissolves a very minute portion only of camphor. Alcohol readily dissolves it; but if water be added to the solution, the camphor is precipitated. Ether, bisulphuret of carbon, the oils (both fixed and volatile), and the acids, also dissolve it. The liquid obtained by dissolving camphor in nitric acid is sometimes termed *camphor oil*: it is a *nitrate of camphor*. Camphor is insoluble in alkaline solutions. The vapour of camphor passed over red-hot lime is converted into a liquid called *camphrone* (composed of $C^{24} H^{17} O$).

COMPOSITION.—Camphor has the following composition:—

	Eq.	Eq. Wt.	Per cent.	Dumas.	Blanchet and Sell.
Carbon	10	60	78·94	78·02	77·96
Hydrogen	8	8	10·53	10·39	10·61
Oxygen	1	8	10·53	11·59	11·43
Camphor	1	76	100·00	100·00	100·00

Dumas has suggested that camphor may be regarded as an oxide of a base (as yet hypothetical) which he calls *camphogen*, and whose composition is $C^{10} H^{8}$.

CHEMICAL CHARACTERISTICS. — Camphor is readily known by its odour. It does not blacken in burning. It agrees in many of its properties with the *volatile oils* (p. 76). From these it differs, however, in its solidity at ordinary temperatures, and in its not being converted into resin by the oxygen of the air or by nitric acid. By repeatedly distilling nitric acid from camphor, the latter is converted into *camphoric acid* (composed of $C^{10} H^{8} O^{5}$). Before the whole of the camphor has been converted into camphoric acid, there are produced intermediate compounds of camphor and this acid, which we may regard as camphorates of camphor. Ordinary camphor is distinguished from *Borneo camphor* (the produce of *Dryobalanops aromatica*, Gærtn.) by its greater volatility, its less sp. gr., and its being softer and tougher. *Artificial camphor* is a hydrochlorate of oil of turpentine, and is composed of Chl. $H + C^{20} H^{16}$. According to Orfila (*Toxicol. Gén.*) it produces no lesion of the nervous system, but confines its action to the production of a few small ulcers in the mucous membranes of the stomach.

PHYSIOLOGICAL EFFECTS. (*a.*) *On vegetables.*—Gœppert (Poggendorf, *Ann. d. Phys. u. Chem.* 1828) has satisfactorily shewn,—1st, that solutions of camphor act in the same deleterious manner on plants as the volatile oils; 2dly, that they destroy the mobility of contractile parts without previously exciting them; 3dly, that they have no influence either on the germination of phanerogamia, or the vegetation of the cellular cryptogamia; and 4thly, that the vapour only is sufficient to destroy fleshy plants and ferns.

(*b.*) *On animals generally.*—The action of camphor on animals has been the subject of numerous experiments made by Hillefield, (quoted by Wibmer, *Wirk. d. Arzneim. ü. Gifte.* Bd. iii. S. 215), Monro (*Essays and Observ. Phys. and Lit.* vol. iii. p. 351), Menghini and Carminati (Wibmer, *loco cit.*), Viborg, Hertwich (*Ibid.*), Orfila (*Toxicol. Gén.*), and Scudery (Wibmer, *op. cit.*)

Air impregnated with the vapour of camphor proves injurious to *insects* (the Tineæ, which destroy wool, excepted). Sooner or later it causes frequent agitation, followed by languor, insensibility, convulsions, and death (Menghini). To *amphibials* (frogs) the vapour also proves noxious. It produces preternatural movements, difficult respiration, trembling, and stupor (Carminati). Given to *birds* and *mammals*, in sufficient doses, camphor proves poisonous, but the symptoms which it gives rise to do not appear to be uniform. Indeed there are few remedies whose action on the animal economy is so variable as that of camphor. Three drachms dissolved in oil and given to a dog, the œsophagus being tied, caused violent convulsions, somewhat analogous to those of epilepsy, followed by insensibility and death (Orfila). When administered in substance, it inflamed the digestive tube, caused ulceration, and, after its absorption, gave rise to convulsions (Ibid.) Given to horses, in doses of two drachms, it excites spasmodic movements, and quickens the pulse, but does not determine any serious result (Moiroud, *Pharm. Vétér.*). Tiedemann and Gmelin (*Versuche ü. d. Wege aus welchen Subst. aus d. Mag. u. Darmk. ins Blut gelang.* S. 24 and 25) detected the odour of camphor in the blood of the vena porta and of the mesenteric vein of a horse, to whom they had given camphor; but they could recognize it neither in the chyle nor in the urine. It is evolved from the system principally by the bronchial surfaces; for the breath of animals, to which this substance has been administered, has a strong odour of camphor. Moiroud (*op. cit.*) observed that the skin of a horse, into whose jugular vein camphor had been injected, smelt of this substance.

"The general sedative effects of camphor on animals are rarely well marked; however, when administered in a proper dose, and in cases really requiring its use, it sometimes causes a diminution in the force and frequency of the pulse, and seems to allay pain" (Moiroud).

Scudery (quoted by Dr. Christison) observed that the convulsions caused in animals by camphor were accompanied with a peculiar kind of delirium, which made them to run up and down without apparent cause. He also found the urinary organs generally affected, and for the most part with strangury.

(*c.*) *On man.*—No article of the materia medica has had more contradictory statements made respecting its effects and mode of action than camphor. These, however, have principally referred to its influence over the functions of circulation and calorification; for, with regard to the modifications which it induces in the other functions, scarcely any difference of opinion prevails.

Its local action on the mucous surfaces, the denuded dermis, and ulcers, is that of an *acrid*. A piece of camphor held in the mouth for half an hour caused the mucous lining of this cavity to become red, hot, swollen, and painful; and it is highly probable that, had the experiment been persevered in, ulceration would have followed (Trousseau and Pidoux, *Traité de Thérap.* t. i. p. 43). The pain and uneasiness which camphor, when swallowed in substance, sometimes produces in the stomach, is likewise imputed to its local action as an acrid. Rubbed on the skin covered with cuticle, Dr. Cullen says that it causes neither redness nor other mark of inflammation (*Mat. Med.* vol. ii. p. 298); but Dr. Clutterbuck (*Inquiry into the Seat and Nature of Fever*, 2d ed. p. 424) declares this to be "undoubtedly a mistake." When applied to the denuded dermis, or to ulcers, it produces pain, and appears to act as an irritant. These observations respecting the local action of camphor on man, are confirmed by the ascertained effects of this substance on other animals.

Camphor becomes absorbed, and is thrown out of the system by the bronchial membrane principally, but also by the skin. Trousseau and Pidoux (*op. supracit.* p. 49) recognized its odour in every case in the pulmonary exhalation, but failed to detect it in the cutaneous perspiration. Cullen, however, says (*op. cit.* p. 305) that "Mr. Lasonne, the father, has observed, as I have done frequently, that camphor, though given very largely, never discovers its smell in the urine, whilst it frequently does it in the perspiration and sweat." The non-detection of it in the urine agrees with the observation of Tiedemann and Gmelin with regard to horses, already noticed.

Camphor specifically affects the nervous system.—Regarding the symptoms of this effect but little difference of opinion prevails. In large doses it causes disorder of the mental faculties, the external senses, and volition, the symptoms being lassitude, giddiness, confusion of ideas, disordered vision, noise in the ears, drowsiness, delirium or stupor, and convulsions. These phenomena, which have been observed in several cases, agree with those noticed in experiments on brutes. In its power of causing stupor, camphor agrees with opium; but it differs from the latter in its more frequently causing delirium and convulsions. Epilepsy has been ascribed to the use of camphor.

The quality of the influence which camphor exercises over the vascular system has been a subject of much contention. From my own limited observations of its use *in small* or *medium doses* (from five to ten grains), I am disposed to regard its leading effect as that of a vascular excitant, though I am not prepared to deny that slight depression may not have preceded this effect. Combined with a diaphoretic regimen (warm clothing and tepid diluents), I have seen camphor increase the fulness of the pulse, raise the temperature of the surface, and operate as a sudorific. If opium be conjoined, these effects are more manifest.

In *excessive doses* it acts as a powerful poison. The best related case is that of Mr. Alexander (*Experim. Essays*, p. 128, 1768), who swallowed two scruples in syrup of roses. In about twenty minutes he experienced lassitude and depression of spirits, with frequent yawnings: at the end of three-quarters of an hour his pulse had fallen from 77 to 67. Soon after he felt giddy, confused, and almost incapable of walking across the room. He became gradually insensible, and in this condition was attacked with violent convulsions and maniacal delirium. From this state he awoke as from a profound sleep; his pulse was 100, and he was able to reply to interrogatories, though he had not completely recovered his recollection. Warm water being administered, he vomited up the greater part of the camphor, which had been swallowed three hours previously; and from this time he gradually recovered.

In some other well-reported cases, camphor, in large doses, caused depression of the vascular system, followed, in some of the instances, by those of excitement. In the instances related by Fred. Hoffmann (*Op. Omnia*, t. iv. p. 26, Geneva, 1748), Pouteau (Murray, *App. Med.* vol. iv.), Griffin (quoted by Alexander), Cullen (*Mat. Med.* vol. ii. p. 295), Callisen (Murray, *App. Med.*), Edwards (Orfila, *Tox. Gén.*), and Trousseau and Pidoux (*Traité de Thérap.* t. i. p. 48) sedation of the vascular system was observed. It was manifested by a languid, small, and slower pulse, coldness of the surface, and pallid countenance; in some cases with cold sweat. In some of these instances, symptoms of vascular excitement followed those of depression. The pulse became more frequent and fuller than natural, and the heat of the surface augmented. Trousseau and Pidoux (*op. cit.* p. 51) ascribe the symptoms of sedation to the depressing influence which camphor exerts over the system by sympathy; while the sanguineous excitation they refer to the passage of camphor into the blood, and the efforts of the organism to eliminate this unassimilable principle. But in some of the cases in which excessive doses of camphor have been taken, no symptoms of depression were manifested; as in the instance mentioned by Dr. Eickhorn (in whom great heat, rapid but small pulse, copious sweating, and agreeable exhilaration, were produced by 120 grs. (*Lond. Med. Gaz.* vol. xi. p. 772), by Dr. Wendt (quoted in Dr. Christison's *Treat. on Poisons*, p. 810), by Scudery (Wibmer, *op. supracit.*), and by Bergondi (*Ibid.*)

Camphor has long been celebrated as an anaphrodisiac; the smell of it even is said to be attended with this effect; hence the verse of the School of Salernum, "*Camphora per nares castrat odore mares.*" Trousseau and Pidoux (*op. cit.* p. 48) experienced the anaphrodisiac property of 36 grains of camphor taken into the stomach.

Strangury has also been ascribed to this substance by Heberden (*Comment.* art. *Stranguria*) and by Scudery (*supracit.*)

Uses.—The discrepancy among authors as to the physiological effects of camphor has had the effect of greatly circumscribing the use of this substance. Indeed, until its operation on the system be more satisfactorily ascertained, it is almost impossible to lay down general rules which should govern its exhibition. The following are the principal maladies in which it has been found useful:—

1. *Fever.*—Camphor has been employed in those forms of fever which are of a typhoid type. It is chiefly valuable by causing determination to the surface and giving rise to diaphoresis. Hence those remedies should be conjoined with it which promote these effects: such are ipecacuanha, emetic tartar, and the vegetable alkaline salts. Opium greatly contributes to the sudorific effects of camphor; and, when it is admissible, benefit is sometimes obtained by the administration of one grain of opium with five or eight of camphor. But in a great number of cases of fever the cerebral disorder forbids the use of opium. From its specific influence over the cerebral functions, camphor has been frequently used in fever to allay the nervous symptoms, such as the delirium, the watchings, the subsultus tendinum, &c.; but it frequently fails to give relief. Dr. Home (*Clin. Hist.* p. 36) did not find any advantage from its use in the low nervous fever; and Dr. Heberden (*Comment.* art. *Febris*) has seen one scruple of camphor given every six hours, without any perceptible effect in abating the convulsive catchings, or composing the patient to rest.

2. *In Inflammatory Diseases.*—In the latter stages of inflammation of internal important parts (as the serous and mucous membranes, the stomach, intestines, uterus, &c.) after proper evacuations have been made in the earlier periods of the disease, when great exhaustion is manifested by a small feeble pulse and a cool flaccid skin, small but repeated doses of camphor have been employed to determine to the skin, and to promote diaphoresis. It is particularly serviceable in rheumatic inflammation, and especially when produced by metastasis (Sundelin, *Handb. d. spec. Heilmittell.* Bd. ii. S. 145).

3. *In the Exanthemata.*—Camphor has been employed in small-pox,

as also in measles, scarlatina, and miliary fever; but it is admissible only when the circulation flags, and the temperature of the surface falls below the natural standard. In such cases it is sometimes employed along with a diaphoretic regimen to determine to the skin. It is to be carefully avoided when inflammation of the brain or its membranes is feared. It has been asserted that if a camphorated ointment be applied to the face, no small-pox pustules will make their appearance there; but the statement is not correct.

4. *In Mania, Melancholia, and other forms of Mental Disorder.*—Camphor is occasionally taken to raise the spirits. I am acquainted with two persons (females), both of nervous temperament, who use it for this purpose. In mania and melancholia it has now and then proved serviceable by its narcotic effects, inducing mental quiet and causing sleep. It was used in these affections by Paracelsus and several succeeding writers (Murray, *App. Med.* vol. iv. p. 499), especially, in more modern times, by Dr. Kinneir (*Phil. Trans.* vol. xxxv.), and by Avenbrugger (*Experim. de remed. specif. in mania virorum*, Vind. 1776). The latter regards it as a specific in the mania of men, when accompanied with a small contracted penis, corrugated empty scrotum, or when both testicles are so retracted that they appear to be introduced into the abdominal cavity.

5. *In Spasmodic Affections.*—The narcotic influence of camphor has occasionally proved serviceable in some spasmodic or convulsive affections, viz. spasmodic cough, epilepsy, puerperal convulsions, hysteria, and even tetanus; its use, however, requires caution.

6. *In Irritation of the Urinary or Sexual Organs.*—A power of diminishing irritation of the urinary organs has long been assigned to camphor. In strangury and dysury, especially when produced by cantharides, it is said to have been used with benefit—a statement apparently inconsistent with that more recently made of its producing irritation of the urinary organs. In satyriasis, nymphomania, and onanism, it is said to have proved advantageous by its anaphrodisiac properties. In dysmenorrhœa it sometimes proves serviceable as an anodyne.

7. *In Poisoning.*—Small doses of camphor (administered by the mouth or by the rectum) have been exhibited with apparent benefit in cases of poisoning by opium (Orfila, *Toxicol. Gén.*) It has also been employed to mitigate the effects of cantharides, squills, and mezereon (Hahnemann, and Van Bavegem, in Marx's *Die Lehre v. d. Giften*, Bd. ii. S. 202 and 358); but toxicologists, for the most part, do not admit its efficacy; at any rate, further evidence is required to establish it. Nor does there appear any valid testimony for believing that camphor possesses the power of checking mercurial salivation, as some have supposed.

8. *In Chronic Rheumatism and Gout.*—A mixture of camphor and opium, in the proportions before mentioned, is useful in chronic rheumatism, by its sudorific and anodyne properties. Warm clothing and diluents should be conjoined. In chronic gout, also, camphor is said to have proved beneficial.

9. *In Cholera.*—The combination of camphor and opium, above referred to, I have seen used with benefit in cholera.

10. *Externally*, camphor is employed in the form of vapour, in solution, or, more rarely, in the solid state. The *vapour* is occasionally inhaled in spasmodic cough; and is applied to the skin to alleviate pain

and promote sweat, constituting the *camphor fumigations* (*fumigationes camphoræ*). Dupasquier (*Revue Méd.* t. ii. p. 218, 1826) recommended these fumigations in chronic rheumatism. The patient may be in bed or seated in a chair; and, in either case, is to be enveloped by a blanket tied round the neck. About half an ounce of camphor is then to be placed on a metallic plate, and introduced within the blanket (under the chair, if the patient be seated). In *solution*, camphor is used either as an anodyne or a local stimulant. The nitric solution of camphor is used to relieve toothache. A solution of camphor in oil has been used as an injection into the urethra, to relieve ardor urinæ in gonorrhœa, and into the rectum to mitigate tenesmus arising from ascarides or dysentery. The acetic and alcoholic solutions of camphor are mostly employed as stimulants. In *substance* camphor is not frequently used. A scruple or half a drachm "added to a poultice, and applied to the perineum, allays the chordee, which is a painful attendant upon gonorrhœa" (*United States Dispensatory*). Powdered camphor is a constituent of some tooth powders, to which it communicates its peculiar odour.

The foregoing are some only of the maladies in which camphor has been extensively used and lauded. I must refer to the works of Murray (*App. Med.* vol. iv.) for various other uses which have been made of this substance. It is scarcely necessary to add, that camphor bags possess no prophylactic properties against contagion.

Administration.—The medium dose of it is from five to ten grains; but it is frequently exhibited in much smaller doses (as one grain); and occasionally a scruple has been employed. It is given in the form of pill or emulsion. That of *pill* is said to be objectionable, "as in this state the camphor is with difficulty dissolved in the gastric liquors, and, floating on the top, is apt to excite nausea, or pain or uneasiness at the upper orifice of the stomach" (*United States Dispensatory*). The *emulsion* is made by rubbing up the camphor with loaf sugar, gum arabic, and water; and the suspension will be rendered more complete by the addition of a little myrrh (*Ibid.*)

1. *Mistura Camphoræ*, L. E. D.; *Aqua Camphoræ*.—(Camphor, ʒss.; Rectified Spirit, ♏x.; Water, Oj. First rub the camphor with the spirit, then with the water gradually poured in, and strain through linen, *L.*—The *Dublin College* employs of Camphor, ℈j. only; of Rectified Spirit, gtt. x.; of Refined Sugar, ℥ss.; of Hot Water, Oj. The camphor is to be first rubbed with the spirit, then with the sugar; lastly, add the water during the trituration, and filter the mixture through bibulous paper, *D.*—The *Edinburgh College* employs Camphor, ℈j.; Sweet Almonds, and Pure Sugar, of each, ℥ss.; Water, Oj. Steep the almonds in hot water, and peel them; rub the camphor and sugar well together in a mortar; add the almonds; beat the whole into a smooth pulp; add the water gradually, with constant stirring, and then strain, *E.*) The *camphor mixture* kept in the shops is often prepared by suspending camphor in water without the intervention of any third body. The quantity of this substance dissolved is exceedingly small. The rectified spirit, employed by the London and Dublin Colleges, serves to promote the pulverization, and, very slightly perhaps, the solution of the camphor. Sugar also assists its diffusion through water. The preparation of the Edinburgh Pharmacopœia is, in fact, an emulsion. None of these artificial mixtures, however, are very permanent, and the quantity of cam-

phor which remains in solution is so small that the liquid can scarcely be said to possess more than the flavour and odour of camphor. Hence its principal value is as a vehicle for the exhibition of other medicines. Its usual dose is from f℥j. to f℥ij.

2. *Mistura Camphoræ cum Magnesia*, E. D.—(Camphor, gr. x. [gr. xij. *D.*]; Carbonate of Magnesia, gr. xxv. [ʒss. *D.*]; Water, f℥vj. Triturate the camphor and carbonate of magnesia together, adding the water gradually). The carbonate of magnesia promotes the solution of the camphor in water. This mixture, therefore, holds a larger quantity of camphor in solution than the previous one. A minute portion of magnesia is also dissolved. As the magnesian carbonate is not separated by filtration, it gives to the mixture antacid properties, in addition to those qualities which this preparation derives from the camphor. "In addition to the uses of the simple camphor mixture, this preparation has been found very beneficial in the uric acid diathesis, and also in irritations of the neck of the urinary bladder, particularly when given in combination with hyoscyamus" (Dr. Montgomery, *Observ. on the Dubl. Pharm.*) The dose is f℥ss. to f℥j.

3. *Tinctura Camphoræ*, L. E.; *Tinctura Camphoræ*, sive *Spiritus Camphoratus*, D.; *Camphorated Spirits of Wine*, offic.—(Camphor, ℥v. [℥j. *D.*; in small fragments, ℥j. *E.*]; Rectified Spirit, Oij. [f℥xvj. *E.* Oss. *D*]. Mix, that the camphor may be dissolved.) The principal use of this preparation is as a stimulant and anodyne liniment in sprains and bruises, chilblains, chronic rheumatism, and paralysis. Water immediately decomposes it, separating the greater part of the camphor, but holding in solution a minute portion, thereby forming an extemporaneous camphor mixture. By the aid of sugar or mucilage, the greater part of the camphor may be suspended in water. Employed in this form, we may give tincture of camphor internally, in doses of from ♏x. to fʒj.

4. *Tinctura Camphoræ composita*, L.; *Tinctura Opii camphorata*, E. D.; *Paregoric Elixir*, offic.—(Camphor, ℈ijss. [℈ij. *D.*]; Opium, powdered, [sliced, *E.*] gr. lxxij. [ʒj. *D.* ℈iv. *E.*]; Benzoic Acid, gr. lxxij. [ʒj. *D.*]; Oil of Anise, fʒj.; Proof Spirit, Oij. Macerate for fourteen [seven, *E.*] days, and filter.) This is a very valuable preparation, and is extensively employed both by the public and the profession. Its active ingredient is opium. The principal use of it is to allay troublesome cough unconnected with any active inflammatory symptoms. It diminishes the sensibility of the bronchial membrane to the influence of cold air, checks profuse secretion, and allays spasmodic cough. Dose, fʒj. to fʒiij. A fluidounce contains nearly two grains of opium. The name given to this preparation by the London College, though less correct than that of the Edinburgh and Dublin Colleges, is, I conceive, much more convenient; since it enables us to prescribe opium without the knowledge of the patient—no mean advantage in cases where a strong prejudice exists in the mind of the patient or his friends to the use of this important narcotic. Furthermore, it is less likely to give rise to serious or fatal errors in dispensing. In a case mentioned by Dr. M. Good (*Hist. of Med.* 1795, App. p. 14) laudanum was served, by an ignorant dispenser, for *tinct. opii camph.* The error proved fatal to the patient.

5. *Linimentum Camphoræ*, L. E.; *Oleum Camphoratum*, D.; *Camphor Liniment*, offic.—(Camphor, ℥j. [ʒi. *D.*]; Olive Oil, fʒiv. [℥j. *D.*]

Shake them together until they are mixed, *L.* Rub them together [in a mortar, *E.*] until the camphor is dissolved, *E. D.*) A stimulant and anodyne embrocation in sprains, bruises, and rheumatic and other local pains. In glandular enlargements it is used as a resolvent.

6. *Linimentum Camphoræ compositum*, L. D.; *Compound Liniment of Camphor.*—(Camphor, ℥iiss. [ii. *D.*]; Solution of Ammonia, f℥viiss. [f℥vi. *D.*]; Spirit of Lavender, Oj. [wine measure, *D.*] Mix the solution of ammonia with the spirit; then let a pint distil from a glass retort with a slow fire; lastly, dissolve the camphor in it.) A powerful stimulant and rubefacient, producing, when freely used, considerable irritation and inflammation. It is applicable in the same cases as the simple *camphor liniment* and the *liniment of ammonia* (p. 176). From both of these compounds it differs in not being greasy. "I have used," says Dr. Montgomery, (*op. supracit.*) "a liniment composed of two parts of this and one of turpentine, with children, as a substitute for a blister; and with good effect; or, with equal parts of the *anodyne liniment*, I have found it highly beneficial in the removal of those distressing pains in the back which so frequently annoy women about the close of their pregnancy."

7. *Linimentum Ammoniæ compositum*, *E.*—(Stronger Aqua Ammoniæ [D. 880], f℥v.; Tincture of Camphor, f℥ij.; Spirit of Rosemary, fʒi. Mix them well together. This liniment may be also made weaker for some purposes with three fluidounces of tincture of camphor and two of spirit of rosemary). The effects and uses of this preparation are the same as the last.

8. *Acidum Aceticum Camphoratum*, E. D.—(Camphor, ʒss.; Acetic Acid, f℥viss. [ʒvi. *D.*] Pulverize the camphor with the aid of a little rectified spirit, and dissolve it in the acid). This preparation is an officinal substitute for *Henry's Aromatic Vinegar.* The spirit is merely used to reduce the camphor to powder. Camphorated acetic acid is exceedingly pungent and corrosive. Its vapour is snuffed up the nostrils as a powerful stimulant in syncope. It is never used internally.

Antidote.—In a case of poisoning by camphor, first evacuate the contents of the stomach. Hufeland (Marx, *Die Lehre von d. Gift.* Bd. ii. S. 202) recommends the use of opium to relieve the effects of camphor. Phœbus (*Handb. d. Arzneiverord.* 2te Ausg.) directs chlorine water to be administered as the antidote, and afterwards purgatives and clysters. Vinegar and coffee, he states, promote the poisonous operation. Wine assists the patient's recovery.

Sas'safras officina'le, Nees, E.—*The Sas'safras Tree.*

Laurus Sassafras, *Linn. L. D.*

Sex. Syst. Enneandria, Monogynia.

(Radix, *L.*—The Root, *E.*—Lignum, Radix, et Oleum volatile, *D.*)

History.—Sassafras wood is mentioned by Monardes (*Hist. Simpl. Med.* 1569-74), who states that it had been recently introduced into Spain from Florida. It was, however, first brought to Europe by the French (Alston's *Lect. on the Mat. Med.* vol. ii. p. 51).

Botany. *Gen. Char.*—Diœcious. *Calyx* six-parted, membranous; segments equal, permanent at the base. *Male flowers:—Fertile stamens* nine, in three rows, the three inner with double-stalked distinct glands at the base. *Anthers* linear, four-celled, all looking inwards. *Female* *flowers* with as many sterile stamens as the male, or fewer; the inner often confluent. *Fruit* succulent, placed on the thick fleshy apex of the peduncle, and seated in the torn unchanged calyx.—*Flowers* yellow, before the leaves. *Leaves* deciduous (Lindley).

Composition.—Neither the wood nor the bark of sassafras has been analyzed. Both contain volatile oil.

Volatile Oil (*Oleum Volatile Sassafras*, E.; *Oleum Sassafras*, D.)—Obtained from the wood by submitting it, with water, to distillation. Is colourless, but, by keeping, becomes yellow or red. Its smell is that of sassafras; its taste hot. Sp. gr. 1·094. Water separates it into two oils, one lighter, the other heavier than water. By keeping, it deposits crystals (stéaroptène), which are readily soluble. Oil of sassafras is rendered orange-red by nitric acid. It is said to be adulterated with oil of lavender or oil of turpentine (Bonastre, *Journ. de Pharm.* vol. xiv.); but the statement, I suspect, does not apply to the oil found in English commerce.

Physiological Effects.—The wood and the bark are stimulant and sudorific. Taken in the form of infusion, and assisted by warm clothing and tepid drinks, they excite the vascular system and prove sudorific. They owe their activity to the volatile oil, which possesses acrid properties.

Uses.—Sassafras is employed as a sudorific and alterative in cutaneous, rheumatic, and venereal diseases. On account of its stimulant properties it is inadmissible in febrile or inflammatory conditions of the system. It is rarely or never used alone, but generally in combination with sarsaparilla and guaiacum.

Administration.—Sassafras is administered in the form of *oil* or *infusion*. The dose of the oil is from two to ten drops. *Sassafras tea*, flavoured with milk and sugar, is sold at day-break in the streets of London, under the name of *saloop*. Sassafras is a constituent of the *Decoctum Sarzæ Compositum;* but the volatile oil is dissipated by boiling (p. 670.)

Lau'rus nob'ilis, Linn. L. D.—*The Sweet Bay.*

Sex. Syst. Enneandria, Monogynia.

(Baccæ. Folia. *L. D.*)

History.—The bay-tree is mentioned, though erroneously, in our translation of the Bible (*Psalms*, xxxvi. 35, 36); the Hebrew word, translated *bay*, meaning *native* (Carpenter's *Script. Nat. Hist.*) Hippocrates (*Opera*, p. 267, 623, 621, &c. ed. Fæs.) used both the leaves and berries of the bay-tree (δάφνη) in medicine. Bay-leaf is analogous to the *Malabathrum* of the ancients (Royle, *Hindoo Med.* pp. 32 & 85.)

Botany. *Gen. Char.*—*Flowers* diœcious or hermaphrodite, involucrated. *Calyx* four-parted; segments equal, deciduous. *Fertile stamens* twelve, in three rows; the outer alternate with the segments of the calyx; all with two glands in the middle or above it. *Anthers* oblong, two-celled, all looking inwards. *Female flowers*, with two to four castrated males, surrounding the ovary. *Stigma* capitate. *Fruit* succulent, seated in the irregular base of the calyx.—*Umbels* axillary, stalked. *Leaf-buds* with valvate papery scales. *Leaves* evergreen (Lindley).

Sp. Char.—The only species.

A *bush* or *small tree*. *Bark* aromatic, rather bitter. *Leaves* alternate, lanceolate or oblong-lanceolate, acute or acuminate, wavy at the edge, somewhat coriaceous. *Flowers* yellowish. *Fruit* (called by Nees a one-seeded fleshy berry, by Decandolle a drupe) bluish-black, oval, size of a small cherry. *Seed* pendulous; *funiculus* compressed, ascending from the base of the fruit, and attached at the top of the testa; *testa* papery; *tunica interna* very thin; *embryo* exalbuminous, composed of two large oleaginous *cotyledons* inclosing superiorly the *radicle*.

Hab.—South of Europe. Cultivated in gardens.

Description.—Bay leaves (*folia lauri*) have a bitter, aromatic taste, and a somewhat aromatic odour. Their infusion reddens litmus. Dried bay-berries (*baccæ lauri*, offic.) are covered externally by a dark-brown, brittle coat, which is produced by the epidermis and succulent covering of the fruit.

Composition. — In 1824 bay-berries were analyzed by Bonastre (*Journ. de Pharm.* x. 30), who found the constituents to be—*Volatile oil* 0·8, *laurin* 1·0, *fixed oil* 12·8, *wax* (stearin) 7·1, *resin* 1·6, *uncrystallizable sugar* 0·4, *gummy extractive* 17·2, *bassorin* 6·4, *starch* 25·9, *woody fibre* 18·8, *soluble albumen* traces, *an acid* 0·1, *water* 6·4, *salts* 1·5.—The ashes (amounting to 1·2) consisted of carbonate of potash and the carbonate and phosphate of lime.

1. *Volatile Oil.*—Is colourless, has an acrid and bitter taste, and the smell of laurel. Below 53½ F. it is a dirty white solid. It is completely liquid at 86 F.

2. *Laurin*; *Camphor of the bay berry.*—A crystalline solid, fusible, and volatile. Has an acrid bitter taste, and an odour analogous to that of the volatile oil. It is insoluble in cold water, but it gives to boiling water a bitter taste. It is soluble in ether and in boiling alcohol. Sulphuric acid renders it yellow; nitric acid liquefies it. Alkalies are without action on it. It is extracted from bay berries by rectified alcohol.

3. *Fixed Oil*; *oil of laurel* (*oleum lauri*). — It is obtained by exposing the dry berries to the vapour of water until they are thoroughly soaked; then rapidly subjecting them to the press. The oil afterwards deposits a crystalline sediment. Two pounds of berries furnish scarcely three ounces of oil. Its consistence is that of oil of olives when half solidified. Its colour is greenish; its odour that of the berry. It is partially soluble in alcohol, completely so in ether. With alkalies it forms soaps.

Physiological Effects.—The berries, leaves, and oil, are said to possess aromatic, stimulant, and narcotic properties. The leaves, in large doses, prove emetic (Merat and De Lens, *Dict. Univ. de Mat. Méd.* t. iv. p. 62).

Uses.—Bay berries or leaves are rarely, if ever, used in medicine in this country. They might, therefore, with great propriety be expunged from the Pharmacopœia. The leaves are employed by the cook on account of their flavour. Both leaves and berries have been used to strengthen the stomach, to expel flatus, and to promote the catamenial discharge. The fixed oil has been used externally to relieve colic, in paralysis of the extremities, and against deafness (Murray, *App. Med.* vol. iv. p. 533). It is also employed in sprains and bruises.

Administration.—Both berries and leaves are used in the form of infusion. The volatile oil of the berries may be given in doses of from one to five or six drops (Lewis, *Mat. Med.*)

Other medicinal Lauraceæ.

Culitlawan or *Clove bark* is obtained from *Cinnamomum Culilawan*, Blume, a native of the Indian islands. Its properties are analogous to those of Cassia-lignea. (See Pereira, in Lindley's *Flora Medica*, p. 331.) It is rarely met with in London.

Massoy bark (in commerce *Misoi*) is the *cortex oninus* of Rumphius. It is used in the cosmetics of the natives of India (Crawford, *Hist. of the Ind. Archip.* vol. i. p. 510) I have never found it in the London shops.

Sintoc bark is the produce of *Cinnamomum Sintoc*, Blume. Its properties are analogous to those of Culitlawan. I have never met with it in London.

The *folia Malabathri* of India are obtained from *Cinnamomum nitidum*, Hooker, and Blume; and from *C. Tamala*. They are aromatic tonics, but are not found in the London market.

Sassafras nuts are the seeds of some Lauraceous plant. "They were imported from Brazil into Stockholm in the middle of the last century, and were found a valuable tonic and astringent medicine: during the continental war they were used as a bad substitute for nutmegs." They are still to be found in some of the old drug houses of London.

ORDER 29. MYRISTICA'CEÆ, *Lindley*.—THE NUTMEG TRIBE.

MYRISTICEÆ, *R. Brown*.

ESSENTIAL CHARACTER.—*Flowers* completely unisexual. *Calyx* trifid, rarely quadrifid; with valvular æstivation. *Males*:—*Filaments* either separate, or completely united in a cylinder. *Anthers* three to twelve, two-celled, turned outwards, and bursting longitudinally; either connate or distinct. *Female*:—*Calyx* deciduous. *Ovary* superior, sessile, with a single erect ovule; *style* very short; *stigma* somewhat lobed. *Fruit* baccate, dehiscent, two-valved. *Seed* nut-like, enveloped in a many-parted *aril*; *albumen* ruminate, between fatty and fleshy; *embryo* small; *cotyledons* foliaceous; *radicle* inferior; *plumule* conspicuous.—*Tropical trees*, often yielding a red juice. *Leaves* alternate, without stipules, not dotted, quite entire, stalked, coriaceous; usually, when full-grown, covered beneath with a close down. *Inflorescence* axillary or terminal, in racemes, glomerules, or panicles; the *flowers* often each with one short cucullate bract. *Calyx* coriaceous, mostly downy outside, with the hairs sometimes stellate, smooth in the inside (Lindley, from R. Brown chiefly).

PROPERTIES.—The bark and pericarp contain an acrid juice. The seed (!) and arillus abound in an aromatic volatile oil, which is mixed with a fixed oil.

Myris'tica officina'lis, Linn. E.—*The Nutmeg Tree.*

Myristica moschata, *Thunberg*, L. D.

Sex. Syst. Diœcia, Monadelphia.

(Nuclei; et oleum destillatum nuclei, *L.*—Kernel of the fruit; volatile oil from the kernel; concrete expressed oil from the kernel, *E.*—Nucleus. Oleum volatile et involucrum *macis* dictum, *D.*)

FIG. 168.

Myristica officinalis.

HISTORY.—Both nutmegs and mace were unknown to the ancient Greeks and Romans; unless, indeed, the κώμακον of Theophrastus (*Hist. Plant.* lib. ix. cap. 7),—the *cinnamum, quod comacum appellant* of Pliny (*Hist. Nat.* lib. xii. cap. 63, ed. Valp.), be our nutmeg, as some have suggested. Both mace and nutmegs are noticed by Avicenna (lib. ii. tract. ii. cap. 456 and 503.

BOTANY. *GEN. CHAR.*—*Flowers* diœcious. *Calyx* urceolate, three-toothed. *Males*:—*Filaments* monadelphous; *anthers* six to ten, connate. *Females*:—*Ovary* simple; *style* none; *stigma* two-lobed. *Pericarp* fleshy, two-valved, one-seeded. *Seed* enveloped in a fleshy aril. (Lindley.)

SP. CHAR.—*Leaves* oblong, acuminate, smooth, whitish beneath, and with simple nerves. *Peduncles* one to four-flowered.

A *tree* from 20 to 25 feet high, similar in appearance to a pear tree. *Bark* dark grayish-green, smooth, with a yellowish juice. *Leaves* aromatic. *Racemes* axillary. *Peduncles* and *pedicels* glabrous, the latter with a quickly deciduous ovate *bract* at its summit, often pressed close to the flower. *Male flowers*:—Three to five on a peduncle: *calyx* fleshy, pale yellow, with a reddish pubescence. *Female flowers* scarcely different from the males, except that the pedicel is frequently solitary.

Fruit pyriform, smooth externally, about the size of a peach, marked externally by a longitudinal groove. *Pericarp* fleshy, dehiscing by two nearly equal longitudinal valves. *Arillus* (*mace*) large, fleshy, branching, scarlet; when dry, yellow, brittle, and somewhat horny. *Nucleus* or *nut* (*nutmeg in the shell*, offic.) within the arillus, oval or ovate: its outer coat (*testa, tunica externa*, or *shell*) is dark brown, hard, glossy, marked by the mace: its inner coat (*endopleura* seu *tunica interna*) closely invests the seed, and dips down into the substance of the albumen, giving it a marbled or *ruminated* appearance. The great body of the nutmeg consists of the oleaginous *albumen*; its so-called veins are processes of the endopleura, which have a reddish-brown colour, and abound in oil. *Embryo* at the base of the seed; *radicle* inferior, hemispherical; *cotyledons* two, large, flat, foliaceous, fan-shaped; *plumule* two-lobed.

Fig. 169.

Nutmeg in the shell, surrounded by the Mace.

Hab.—Moluccas, especially the Isle of Banda. The Dutch have endeavoured to confine the nutmeg tree to three of the little cluster of the Banda isles, viz. Pulo Ay, Banda, and Nera.

Curing.—*Mace* is prepared for the market by separating it from the nutmeg, and drying it for some days in the sun, when its rich crimson changes to dusty yellow. *Nutmegs* require more care in curing, on account of the attacks of an insect (the *nutmeg-insect*). They are first sun-dried for three days; then laid on hurdles and smoke-dried by a slow wood-fire for three months, at the end of which time they are freed from their shells, and dipped twice or thrice in lime-water, or rather a thick mixture of lime and water, to secure them from the depredations of insects. It is said that while the nutmegs are in their shells, they are secure against the attack of these insects (Crawford, *Hist. of the Ind. Archip.*)

Description. 1. *Of Nutmegs.*—The ordinary nutmeg of commerce (formerly called the *female nutmeg,—nux moschata fœmina*, Clusius) rarely exceeds an inch in length. Its shape is roundish or elliptical, like that of the French olive. Externally it is marked with reticular furrows. The colour of the projecting parts is brownish; that of the depression sometimes whitish, from the lime used in curing (*limed nutmegs*), at other times brown (*brown nutmegs*). Internally it is pale reddish-gray, with red veins. The odour is strong, but pleasant, peculiar, and aromatic. The taste is agreeable and aromatic. Occasionally this kind of nutmeg is imported *in the shell*. A long kind of nutmeg, called, in the shops, *the wild nutmeg in the shell* (the *male nutmeg,—nux moschata mas.* Clusius), is frequently met with. Its shape is oblong, like that of the date; its length about an inch and a half. Its shell is bony, somewhat brittle, externally shiny and brown, internally dull, grayish-white. The contained seed is paler coloured, less furrowed, and less aromatic, than in the preceding sort. Sometimes these long nutmegs are imported with the mace dried around them (*wild nutmegs covered with mace*). Long nutmegs are said to be the produce of *Myristica officinalis* var. *sphenocarpa*, Dierbach (Nees and Ebermaier, *Handb. d. Med.-Pharm. Bot.*) A specimen of the fruit and leaves, preserved in spirit in the Banksian collection, is marked the *long nutmeg from Sumatra*.

2. *Of Mace.*—Mace, as met with in the shops, is a flat, irregularly slit, smooth, slightly flexible or brittle membrane, of a pale cinnamon-yellow colour, and an odour and taste analogous to those of nutmegs.

Commerce.—Nutmegs and mace are imported from the Indian Archipelago either directly, or indirectly by the Cape of Good Hope or Holland. In 1838, the duty of 2s. 6d. *per lb.* was paid on 114,093 lbs. of nutmegs, and on 19,297 lbs. of mace (*Trade List*).

Composition.—Nutmegs were analyzed, in 1804, by Schrader (Pfaff, *Mat. Med.* Bd. iv. S. 210); and, in 1823, by Bonastre (*Journ. de Pharm.* t. ix. p. 281). In 1824 an analysis of mace was made by N. E. Henry (*Journ. de Pharm.* t. x. p. 281).

Nutmeg.				Mace.
Schrader's Analysis.		*Bonastre's Analysis.*		*N. E. Henry's Analysis.*
Light volatile oil	2·60	Volatile oil	6·0	Volatile oil.
Heavy ditto	0·52	Liquid fat	7·6	Red fat oil soluble in alcohol.
Expressed, reddish, soft oil	10·41	Solid fat	24·0	Yellow ditto insoluble in ditto.
White solid oil	17·72	Acid (?)	0·8	Alcoholic extractive.
Gummy extract	25·00	Starch	2·4	Amidin.
Resin	3·12	Gum	1·2	Ligneous fibre with lime.
Ligneous fibre	34·38	Ligneous fibre	54·0	
Loss	6·25	Loss	4·0	
Nutmeg	100·00		100·0	Mace.

1. *Volatile Oil of Nutmegs* (*Oleum Nucis Moschatæ*).—Procured by submitting nutmegs vith water to distillation. It is colourless or pale yellow, has the odour and taste of lutmegs, and a viscid consistence. By agitation with water, it separates into two oils, ne lighter, the other heavier than water. By keeping, it deposits crystals of stéaropène (*myristicine*), which are fusible at 212° F., volatile, soluble in alcohol, in ether, nd in boiling water: from the latter liquid myristicine separates in a crystalline form s the liquid cools.

2. *Volatile Oil of Mace* (*Oleum Macidis*).—It is colourless or pale yellow, lighter than vater, and has the odour and flavour of mace.

3. *Expressed Oil of Nutmegs* (*Expressed Oil of Mace*, offic.; *Butter of Nutmeg*; *Iyristicæ Adeps*, Ph. Ed.)—It is prepared by beating the nutmegs to a paste, which is o be inclosed in a bag, and then exposed to the vapour of water, and afterwards ex-ressing by heated plates. It is imported in oblong cakes (covered by some monocotyle-onous leaves, commonly called *flag leaves*), which have the shape of common bricks, ut whose size is somewhat smaller. Its colour is orange, its consistence firm, its dour fragrant, like that of the seeds from which it is obtained. It is composed of *allow-like oil* 7, *yellow oil* $8\frac{1}{3}$, and *volatile oil* $\frac{2}{3}$. Cold alcohol and ether dissolve the ellow and volatile oils. Boiling alcohol dissolves all three oils (Thomson's *Org. Chem.* . 442). It is said to be often adulterated.

Chemical Characteristics.—The presence of starch in both nutmegs nd mace may be detected by a solution of iodine, which gives them a lue tint (*iodide of starch*). Both of these substances yield, by distilla-on with water, *a volatile oil*, characterized by its peculiar odour; and oth yield, by expression, a *fixed, butyraceous oil.*

Physiological Effects.—The activity of both nutmegs and mace epends on the volatile oil which they contain. Swallowed *in moderate uantities*, they produce the before-described effects of the spices (p. 72). *n large doses* they prove narcotic, and cause giddiness, delirium, præcordial anxiety, sleepiness, or actual stupor. Instances of this kind are mentioned by Bontius (*De Med. Indor.*), Rumphius (*Herb. Amboyn.* vol. ii. p. 21), Lobel (quoted by Murray, *App. Med.* vol. vi. p. 145), Schmid (*Ibid.*), and Cullen (*Mat. Med.* vol. ii. p. 204). In the case related by the last-mentioned authority two drachms of powdered nutmegs produced drowsiness, which gradually increased to complete stupor and insensibility. The patient continued for several hours alternately delirious and sleeping, but ultimately recovered. Purkinje (quoted by Wibmer, *Die Wirk. d. Arzneim. ü. Gifte.* Bd. iii. S. 308) has confirmed these statements by experiments made on himself. I am also acquainted with a case in which the narcotic effects of a whole nutmeg have been several times experienced.

USES.—The principal consumption of nutmegs and mace is for dietetical purposes. They serve to flavour, and, by their stimulant properties, to assist the digestive process. Food highly seasoned with these substances may prove injurious in cerebral affections (apoplexy, for example), on account of their narcotic properties.

Medicinally they are used, like other spices (see p. 72), as stimulants, carminatives, and flavouring ingredients. Nutmeg is an important constituent of the *confectio aromatica* (see p. 358), so frequently employed as a cordial and antacid in bowel complaints. In mild cases of diarrhœa I frequently employ nutmeg as a substitute for opium. It may be taken in warm brandy and water, unless the use of spirit be contra-indicated. The expressed oil of nutmeg is sometimes employed externally in chronic rheumatism and palsy. The volatile oil has also been used in similar cases. The expressed oil is a constituent of the *Emplastrum Picis*, L.; but the Edinburgh College substitute oil of mace (see p. 718).

ADMINISTRATION.—Either nutmeg or mace may be taken to the extent of a scruple or half a drachm, in powder obtained by grating; or the volatile oil of these substances may be used, in the dose of ♏j. to ♏v.

SPIRITUS MYRISTICÆ, L. E. D.—(Nutmegs, bruised, ℥iiss. [℥ij. *D.*]; Proof Spirit, *cong.* i. [wine measure, *D.*]; Water, Oj. [sufficient to prevent empyreuma, *D.*] Mix them [macerate for twenty-four hours, *D.*], then [with a slow fire, *L.*] let a gallon distil). It is frequently prepared by mixing volatile oil of nutmegs with proof spirit. It is cordial and carminative; and is employed, in doses of fʒi. to fʒiv., as a pleasant addition to stimulant, narcotic, or purgative draughts.

ORDER 30. THYMELA'CEÆ, *Lindley*.—THE MEZEREUM TRIBE.

THYMELEÆ, *Jussieu*.

ESSENTIAL CHARACTER.—*Calyx* inferior, tubular, coloured; the limb four-cleft, seldom five-cleft, with an imbricated æstivation. *Corolla* none, or sometimes scale-like petals in the orifice of the calyx. *Stamens* definite, inserted in the tube or its orifice often eight, sometimes four, less frequently two; when equal in number to the segments of the calyx or fewer, opposite to them; *anthers* two-celled, dehiscing lengthwise in the middle. *Ovary* solitary, with one solitary pendulous ovule; *style* one *stigma* undivided. *Fruit* hard, dry, and nut-like, or drupaceous. *Albumen* none, or thin and fleshy; *embryo* straight; *cotyledons* plano-convex; *radicle* short, superior *plumule* inconspicuous. *Stem* shrubby, very seldom herbaceous, with tenacious bark *Leaves* without stipules, alternate or opposite, entire. *Flowers* capitate or spiked terminal or axillary, occasionally solitary (R. Brown).

PROPERTIES.—The prevailing property of the plants of this order is acridity.

Daph'ne Meze'reum, Linn. L. E. D.—*Common Meze'reon* or *Spurge-Ol'ive*.

Sex. Syst. Octandria, Monogynia.

(Radicis cortex, *L.*—Root-bark, *E.*—Cortex, *D.*)

History.—Tragus (*Hist. Stirpium.* 1532) is the earliest author who mentions this plant (Sprengel, *Hist. Rei Herb.* Præf. xi.) He calls it *Thymelæa*. The *mezereon* of Avicenna (lib. 2ndus, tract. 2ndus, cap. 464) and of other Arabian authors, is declared, by C. Bauhin, to be *Chamelæa tricocca* (now called *Cneorum tricoccon*), a plant of the order Euphorbiaceæ; but it is probably identical with the χαμελαία of Dioscorides, which is declared by Sibthorp (*Prod. Fl. Græcæ*) to be *Daphne oleoides*.

Botany. *Gen. Char.* — *Calyx* four-lobed. *Stamens* eight. *Styles* short, terminal. *Berry* one-celled, one-seeded (*Bot. Gall.*)

Sp. Char.—*Flowers* naked on the stem, sessile, about three together. *Leaves* lanceolate, deciduous (Smith).

Stem bushy, four or five feet high, with upright, alternate, smooth, tough, and pliant branches; leafy while young. *Leaves* scattered, stalked, lanceolate, smooth, two inches long, appearing after the flowers, and soon accompanied by flower-buds for the next season. *Flowers* highly, and to many persons too powerfully, fragrant, seated in little tufts on the naked branches, with several brown, smooth, ovate bracteas underneath. *Calyx* like a corolla in texture, crimson all over; the tube, externally hairy. *Berries* scarlet.—There is a variety with white *flowers*, and the *berries* also vary to a yellow or orange hue.

Hab.—Indigenous. Plentiful near Andover. Flowers in March.

Description of the Bark.—The *bark of the root* is alone employed in this country. It is tough, pliable, and fibrous; externally brown and corrugated; internally white and cottony. Its taste is at first sweetish, afterwards highly acrid: it has no odour. In Germany the bark of the stem and larger branches is removed in spring, folded in small bundles, and dried for medicinal use.

Composition.—The bark of the stem was analyzed by C. G. Gmelin and Bär (L. Gmelin's *Handb. d. Chem.* Bd. ii. S. 1317), and found to consist of *wax*, *an acrid resin*, *daphnin*, a trace of *volatile oil*, *yellow colouring principle*, *uncrystallizable but fermentable sugar*, *nitrogenous gummy matter*, *reddish brown extractive*, *woody fibre*, *free malic acid*, and *malates* of *potash*, *lime*, *and magnesia*.

1. *Acrid Resin.*—Obtained by boiling the bark in alcohol: when the solution cools, some wax deposits. The supernatant liquid is to be evaporated, and the residual extract washed with water. The resin then left behind is dark-green, and soluble in both alcohol and ether. To this substance mezereon owes its acridity. There is, however, some reason to suspect that this resin is itself a compound of two principles, viz. an acrid, vesicating, fixed oil, and another substance. The resin is rendered soluble in water by means of the other constituents of the bark.

2. *Daphnin.*—A peculiar crystalline principle, having a bitter, slightly astringent taste. It is soluble in alcohol and ether, but possesses neither basic nor acid properties. Gmelin and Bär consider it to be analogous to asparagin. It is not the active principle of mezereon.

Physiological Effects.—All parts of the plant, but more especially the bark and the fruit, are endowed with excessive acridity; in virtue of which they cause irritation and inflammation in tissues to which they are applied. When swallowed, therefore, in large quantities, they prove poisonous. The topical action of mezereon bark is that of an irritant, and, when the bark has been applied to the skin, vesicant.

A decoction of mezereon bark, taken in moderate quantities, sometimes appears to promote the action of the secreting and exhaling organs (especially the kidneys and the skin). But Dr. Alex. Russell (*Med. Observ. and Inq.* vol. iii. p. 194) could not observe, upon the strictest inquiry, " that it sensibly increases any of the secretions, more than the same quantity of any small liquor would do." In some cases it proves laxative, where the patients are easily moved, and large doses disturb and irritate the stomach. Richter (*Ausführ. Arzneimittell.* Bd. ii. S. 193) says, that, under the long-continued use of mezereon, the saliva acquires a peculiar odour. In larger doses it causes dryness and heat in the throat, increased flow of saliva, pain in the stomach and bowels, and sometimes vomiting and purging; the stools being occasionally bloody. The urinary organs are sometimes specifically affected by it; irritation, analogous to that produced by cantharides, being set up by it. An affection of the cerebro-spinal system (marked by great feebleness, giddiness, incapability of keeping the erect posture, and slight convulsive movements) is occasionally brought on (Vogt, *Pharmakodynamik*, Bd. ii. S. 305, 2te Aufl.) I am unacquainted with any cases which have proved fatal from the use of mezereon bark. Vicat (Orfila, *Toxicol. Gén.*) mentions the case of a dropsical patient, in whom the wood caused diarrhœa, pain, and vomiting, which continued for six weeks.

Uses.—In this country mezereon is scarcely ever employed alone. It is usually administered in conjunction with sarsaparilla (vide *Decoctum Sarzæ compositum*, p. 670), and is employed as a sudorific and alterative in venereal, rheumatic, scrofulous, and chronic cutaneous diseases. Decoction of the root-bark of mezereon was recommended to the notice of the profession, by Dr. Alexander Russell (*op. supracit.* vol. iii. p. 189), as a very efficacious remedy in cases of venereal nodes and nocturnal pains. Dr. Home (*Clin. Exper. and Hist.*) also speaks of it as "a powerful deobstruent in all venereal tumors, of the scirrhous kind, where mercury has failed." But Mr. Pearson (*Observ. on the Effects of Various Articles of the Mat. Med.* 1800), after many years' observations of it, says, " I feel myself authorized to assert unequivocally, that the mezereum has not the power of curing the venereal disease in any one stage, or in any one form." Dr. Cullen (*Mat. Med.*) employed it with success in some cutaneous diseases.

As a topical remedy, it is sometimes applied to relieve the toothache. It is occasionally used as a *masticatory*. Dr. Withering (*Arrangement of Brit. Plants,* vol. ii. p. 490, 7th ed.) cured a case of difficulty of swallowing (arising from a paralytic affection) by mezereon, which he directed to be chewed frequently. In France the bark of both *Daphne Mezereum* and *D. Gnidium* is used as a vesicatory. The mode of applying it is this:—First soften the bark by soaking it in hot vinegar and water, and then apply it to the part by a compress and bandage. The application is to be renewed night and morning, until vesication is produced.

Administration.—Mezereon is administered in the form of *decoction* (prepared by boiling Mezereon Bark, ℥ij.; Liquorice Root, ℥ij.; Water, Oiij. Boil the mezereon bark in the water until the liquid measures Oij.;

and, towards the end of the process, add the liquorice, *Dr. A. Russell*). The dose is ℥viij. four times a day. As a *masticatory*, about two grains of the bark may be chewed.

ANTIDOTE.—In a case of poisoning by mezereon, evacuate the contents of the stomach as speedily as possible, and give emollient drinks, opiates, and the vegetable acids. To counteract inflammatory symptoms, the usual antiphlogistic treatment should be adopted.

Other Medicinal Lauraceæ.

Daphne Gnidium is the Θυμελαία, or *Thymelæa*, of Dioscorides, whose fruit is the *κόκκος κνίδιος*, or *Gnidian berry*, used by Hippocrates. Its properties are similar to those of D. Mezereum. In France the bark (called *garou*) is employed, in the way before described, as a vesicatory.

Daphne Laureola is an indigenous plant, having yellowish-green flowers and black berries. Its effects are analogous to the last-mentioned species.

Lagetta lintearia, or the *Lace Bark Tree*, possesses the medicinal properties of mezereon, and has been used in the same cases (Wright, *Med. Plants of Jamaica*). Its bark may be separated into 20, 30, or more laminæ, which are fine and white, like gauze: of these, caps, ruffles, and even whole suits of ladies' clothes, have been made (Sloane's *Nat. Hist. of Jamaica*, vol. ii. p. 22).

ORDER 31. POLYGONA'CEÆ, *Lindley*.—THE BUCK-WHEAT TRIBE.

POLYGONEÆ, *Jussieu*.

ESSENTIAL CHARACTER.—*Calyx* free, simple, persistent, monosepalous, deeply divided; the *segments* imbricate in æstivation, disposed in a double row; the inner opposite the sides of the ovary, the outer opposite the angles. *Stamens* definite, inserted into the base of the calyx. *Anthers* two-celled, four-furrowed, dehiscing laterally by a double chink. *Ovary* one, free. *Styles* numerous, or *stigmas* numerous, sessile. *Cariopsis*, or *nut*, one-seeded, generally triangular, more or less covered by the calyx. *Embryo* generally lateral, sometimes central, often curved. *Albumen* farinaceous. *Radicle* distinct from the hilum.—*Herbaceous* plants, rarely shrubs. *Stems* nodose. *Leaves* alternate, sheathing, or adnate to an intrafoliaceous sheath or *ochrea*: revolute when young (*Bot. Gall.*)

PROPERTIES.—Oxalic acid is an abundant product of this order. In the free state, or rather in the form of a supersalt, it exists in the leaves and petioles, to which it communicates refreshing and refrigerant qualities. In the root of rhubarb it is found in combination with lime. Tannic acid is another important principle of this order; it exists in the roots, the stems, and the leaves. Colouring matter, in considerable quantity, exists in the roots. In many species the roots are purgative. Some species of Polygonum contain a volatile acrid principle. Nutritive (mucilaginous) matters are yielded by several species.

Rhe'um, Linn.—*One* [*or more*] *undetermined Species*, E.

Rheum palmatum, *L. D.*—R. undulatum, *D.*

Sex. Syst. Enneandria, Monogynia.

(Radix, *L. E. D.*)

HISTORY.—Dioscorides (lib. iii. cap. 11) speaks of a root which he calls *Rha*, or *Rheon* (ῥὰ ῥῆον), and which has been regarded by some as identical with our rhubarb; but the description he has given of it does not apply to the latter substance, and it is therefore fair to presume some other root must be meant. "*Rha*, by some called *Rheon*, grows," says Dioscorides, "in those countries which are beyond the Bosphorus, and from which it is brought. It is a root which is black externally, like to great centaury, but smaller and redder, odourless, loose or spongy, and somewhat smooth internally." Pliny (*Hist. Nat.* lib. xxvii. cap. 105, ed. Valp.) gives a similar account of it, under the name of *Rhacoma:* it comes, he says, from the countries beyond Pontus, resembles the black costus, is odourless, and has a hot, astringent taste. Prosper Alpinus (*De Rhapontico*, 1612) was of opinion that the *Rha* of Dioscorides was the root of Rheum Rhaponticum, which Alpinus obtained from Thracia, in 1608 A.D., and cultivated at Pavia. The later Greek writers are supposed to have been acquainted with our rhubarb. Alexander of Tralles (lib. viii. cap. 3) is the first who speaks of it. He used it in weakness of the liver and dysentery. Paulus Ægineta seems to make a distinction between *Rha* and *Rheon.* For, he says, that, in the crudities and vomiting of pregnant women, we may give "the blood-wort, boiled in water, for drink; and likewise dill, and the *Pontic root, called* Rha *in the dialect of that country*" (Adams's Transl. of the *Med. Works of Paulus*, bk. i. ch. 1). In noticing the practice of the ancients, he says, "Alvine discharges they promoted by giving turpentine to the extent of an olive, when going to rest; or, when they wished to *purge* more effectually, by adding a little *rhubarb*" [Rheon] (*Ibid.* ch. 43). This is the first notice of the purgative properties of rhubarb.

In one of the Arabian authors (Mesue, the younger) we find three kinds of rhubarb mentioned:—The *Indian*, said to be the best; the *Barbarian*; and the *Turkish*, which is the worst of all.

Botany. *Gen. Char.*—*Calyx* petaloid, six-parted, withering. *Stamina* about nine, inserted into the base of the calyx. *Styles* three, reflexed. *Stigmas* peltate, entire. *Achenium* three-cornered, winged, with the withered calyx at the base. *Embryo* in the centre of the albumen (Lindley).

It is not yet ascertained what species of *Rheum* yields the officinal rhubarb. Several species, now cultivated in this country, have been at different times declared to be, partially or wholly, the source of it. Formerly *Rheum Rhaponticum* was supposed to yield it (Alston, *Mat. Med.* vol. i. p. 502).

In 1732, *R. undulatum* was sent from Russia to the Messrs. Jussieu at Paris, and to Rand of Chelsea, as the true rhubarb. This is the species which Linnæus described as *R. Rhabarbarum* (Ibid.) About 1750, at the desire of Kauw Boerhaave, first physician to the Emperor of Russia, the senate commissioned a Tartarian merchant, a dealer in rhubarb, to procure them some seeds of the genuine plant. This he did, or pretended to do; and, on sowing them, two species of *Rheum* were obtained; namely, the *undulatum* and the *palmatum* (Murray, *App. Med.* vol. iv. p. 363). In 1762, seeds of the latter species were received by Dr. Hope, of Edinburgh, from Dr. Mounsey, at Petersburgh: they were sown, and the plants cultivated with success (Hope, *Phil. Trans.* vol. 55, for the year 1765, p. 290). The root of this species being found to agree, in many of its characters, with that of genuine rhubarb, led to the belief that the palmatum was the true species. The inquiries of Pallas, however, raised some doubts about the correctness of this opinion; for the Bucharians declared themselves unacquainted with the leaves of the palmatum, and described the true plant as having round leaves, with a few incisions only at the margin. This description agreed best with *Rheum compactum*, the roots of which were declared, by Millar, who cultivated the plant, to be as good as foreign rhubarb (Murray, 365-6). Georgi says, that a Cossack pointed out to him the leaves of the R. undulatum as the true species (Ibid. p. 360). These accounts were not satisfactory to the Russians; and in consequence, in 1790, Sievers, an apothecary, went to Siberia, under the auspices of Catherine II., with a view of settling the question; but, after four years of persevering attempts to reach the country where the true rhubarb grew, or even to obtain the seeds, he was obliged to be satisfied with negative results only. "My travels," says he, "as well as my acquaintance with the Bucharians, have satisfied me that as yet nobody—that is, no scientific person—has seen the true rhubarb plant. All that is said of it, by the Jesuits, is miserable, confused stuff; all the seeds procured under the name of true rhubarb are false; all the plantations, from those of the Knight Murray down to the flower-pot of a private individual, will never yield true rhubarb. Until further determination, I hereby declare all the descriptions in all the Materia Medicas to be incorrect" (Duncan, *Suppl. to the Edinb. New Disp.* p. 89).

Himalayan rhubarb is obtained from several species of Rheum; viz. *R. Emodi*, Wallich (*Bot. Mag.* t. 3508); *R. Webbianum*, Royle (*Illust. of the Bot. of the Himal. Mount.*); *R. spiciforme*, Royle; and *R. Moorcroftianum*, Royle. But there are no reasons for supposing that they yield any of the rhubarb of European commerce. It is not improbable that the species yielding the officinal rhubarb is yet undescribed. Dr. Royle (*op. cit.*), after referring to the accounts of different authors, as to the precise locality of the country yielding Russian rhubarb, concludes that it is within 95° of E. long. in 35° of N. latitude—that is, in the heart of Tibet." And he adds, "as no naturalist has visited this part, and neither seeds nor plants have been obtained thence, it is as yet unknown what species yields this rhubarb." Further, it is probable, I think, that the Russian and Chinese rhubarbs are procured from different species.

Species.—1. *Rheum palmatum*, Linn. L. D.—" *Leaves* roundish-cordate, half palmate; the lobes pinnatifid, acuminate, deep dull green, not wavy, but uneven, and very much wrinkled on the upper side, hardly scabrous at the edge, minutely downy on the under side; sinus completely closed; the lobes of the leaf standing forwards beyond it. *Petiole* pale green, marked with short purple lines, terete, obscurely channelled quite at the upper end. *Flowering stems* taller than those of any other species" (Lindley).—Perennial. Grows spontaneously in the Mongolian empire, on the confines of China (Murray, *App. Med.* vol. iv. p. 363). Extensively cultivated near Banbury, in Oxfordshire, for the supply of *English rhubarb* to the London market. Its leaf-stalks make excellent tarts and puddings. Prof. Guibourt (*Hist. des Drog.*) observes, that of the roots of *R. palmatum*, *undulatum*, *compactum*, and *Rhaponticum*, those of the first species only possess the exact odour and taste (grittiness excepted) of the China rhubarb. But rhubarb procured from this species cultivated in England is distinguished by several characters from Asiatic rhubarb. How far these may be the result of climate I am not prepared to say.

2. *Rheum undulatum*, Linn. D. — " *Leaves* oval, obtuse, extremely wavy, deep green, with veins purple at the base, often shorter than the petiole, distinctly and copiously downy on each side, looking as if frosted when young, scabrous at the edge; sinus open, wedge-shaped, with the lower lobes of the leaves turned upwards. *Petiole* downy, blooded, semicylindrical, with elevated edges to the upper side, which is narrower at the upper than the lower end" (Lindley).— Perennial. Grows in Siberia (Georgi and Pallas, cited by Murray), and China (Ammann, quoted by Lindley). Cultivated in France, and yields part of the *French rhubarb* (Guibourt, *Hist. des Drog.*) It was formerly cultivated in Siberia as the real officinal plant; but, as genuine rhubarb could not be procured from it, its cultivation has been given up (Ibid.)

3. *Rheum compactum*, Linn. — " *Leaves* heart-shaped, obtuse, very wavy, deep green, of a thick texture, scabrous at the margin, quite smooth on both sides, glossy and even on the upper side; sinus nearly closed by the parenchyma. *Petiole* green, hardly tinged with red, except at the base, semicylindrical, a little compressed at the sides, with the upper side broad, flat, bordered by elevated edges, and of equal breadth at each end" (Lindley).—Perennial. Grows in Tartary and China. Cultivated in France, and yields part of the *French rhubarb*

(Guibourt, *supracit.*) This rhubarb is a very fair imitation of that from China; but is distinguished by its reddish tint, its different odour (common to it, to *R. undulatum*, and *R. rhaponticum*), its close and radiated marbling, its not tinging the saliva, and its not grating under the teeth.

FIG. 170.

Rheum palmatum.

FIG. 171.

Rheum compactum.

4. *Rheum Emodi*, Wallich; *R. australe*, Don.—*Leaves* cordate, acute, dull green, but little wavy, flattish, very much wrinkled, distinctly rough, with coarse short hairs on each side; sinus of the base distinctly open, not wedge-shaped, but diverging at an obtuse angle, with the lobes nearly turned upwards. *Petioles* very rough, rounded-angular, furrowed; with the upper side depressed, bordered by an elevated edge, and very much narrower at the upper than the lower end" (Lindley).—Perennial. Grows on the Himalayas. Its stalks make excellent tarts and puddings.

FIG. 172.

Rheum Emodi.

5. *Rheum Webbianum* (Royle, *Illust. of the Bot. of the Him. Mountains*, p. 318).

6. *Rheum spiciforme* (Royle, *Illustr.* p. 318).

7. *Rheum Moorcroftianum* (Royle, p. 318).

These three are Himalayan species. *R. Emodi* and *Webbianum* furnish *Himalayan rhubarb*, whose properties are very different to those of officinal rhubarb.

8. *R. Rhaponticum*, Linn.—Grows in Thrace; borders of the Euxine sea; north of the Caspian; Siberia, &c. Cultivated in this country for the leaf-stalks, which are used for tarts and puddings. Cultivated also in France, and yields part of the *French rhubarb*.

9. *R. crassinervium*, Fischer.—Habitation unknown. Its roots possess, according to Mr. Anderson, of the Apothecaries' Garden, Chelsea, the colour and odour of Turkey rhubarb (Lindley, *Fl. Med.*)

10. *R. leucorrhizon*, Pallas; *R. nanum*, Sievers.—Said to yield *White* or *Imperial rhubarb*.

Preparation.—The method of curing or preparing Asiatic rhubarb for the market varies somewhat in different localities. In China it is as follows:—The roots are dug up, cleansed, cut in pieces, and dried on stone tables heated beneath by a fire. During the process the roots are frequently turned. They are afterwards pierced, strung upon cords, and further dried in the sun (Du Halde, *Descrip. Géograph. et Hist. de la Chine*, t. iii. p. 492). In Tartary the Mongols cut the roots in small pieces, in order that they may dry the more readily, and make a hole in the middle of every piece, through which a cord is drawn, in order to suspend them in any convenient place. They hang them for the most part about their tents, and sometimes on the horns of their sheep (Bell, *Travels from St. Petersburgh to* divers parts of *Asia*, vol. i. p. 311). Sievers, however, states, that the roots are cut in pieces, strung upon threads, and dried under sheds, so as to exclude the solar rays; and the same author tells us, that sometimes a year elapses from the time of their collection until they are ready for exportation (Duncan, *Suppl. to the Edinb. New. Disp.* p. 88).

Description.—I am acquainted with six kinds of rhubarb, namely, *Russian*, *Dutch-trimmed*, *Chinese*, *Himalayan*, *English*, and *French*.

1. *Russian* or *Bucharian Rhubarb; Turkey Rhubarb*, offic. (*radix rhei russici* seu *muscovitici*, s. *bucharici*, s. *sibirici*, s. *turcici*).—This kind of rhubarb is imported from St. Petersburgh. It is said formerly to have been brought by way of Natolia: hence the name of *Turkey rhubarb*, which it ordinarily bears in the shops (Murray, *App. Med.* vol. iv. p. 379).

According to the treaty entered into between the Russians and Chinese, the commerce between the two nations takes place at the frontiers. Kiachta is the Russian, Maimatschin the Chinese frontier town. All the so-called Russian rhubarb is brought to Kiachta by Bucharian merchants, who have entered into a contract to supply the government with that drug in exchange for furs. It is collected on that long chain of mountains of Tartary, destitute for the most part of woods, and which arises not far from the town of Selin, and extends to the south as far as the lake Kokonor, near Thibet. It is conveyed, in woollen sacks on camels, to Kiachta, where it is examined with much care, in the presence of the Bucharians, by the apothecary stationed at Kiachta for the purpose. The worm-eaten pieces are rejected, the others bored to ascertain their soundness, and all the damaged or decayed parts are cut away. In accordance with the terms of the contract, the pieces, which do not pass examination, are burned; the remainder is then transmitted to Petersburgh, and from thence to us (Pallas, *Voyages en différ. Prov. de l'Empire de Russie*, t. iv. p. 216 et seq.)

It is imported in boxes or cases, covered with a pitched cloth, on the outside of which is a hide. The size of the pieces are various; but, in commerce, the small ones are preferred, and they are, therefore, picked out, and sold as *radix rhei turcici electa*—the larger pieces and the dust being employed for powdering. Their shapes are various, being angular, rounded, irregular, &c. The external appearance of many of the pieces seems to show, that the cortical portion of the root had been shaved off longitudinally by successive strokes of a knife: hence the angular appearance of the external surface. Holes are observed in many of the pieces: some of them extend completely, others only partially through.

Those which extend only to the centre, have been evidently made for the purpose of examining the condition of the interior of the pieces.

Externally the pieces are covered with a bright yellow-coloured powder, usually said to be produced by the mutual friction of the pieces in the chests, during their passage to this country; though many druggists believe it is derived from the process of *rouncing* (that is, shaking in a bag with powdered rhubarb), before its exportation. The odour is strong and peculiar, but somewhat aromatic; it is considered by druggists to be so delicate, that in all wholesale drug-houses a pair of gloves is kept in the Russian rhubarb drawer, with which only are the assistants permitted to handle the pieces. When chewed it feels gritty under the teeth, from the presence of numerous crystals of oxalate of lime: it communicates a bright yellow colour to the saliva, and has a bitter, slightly astringent taste.

Beneath the dust with which the pieces are covered, the surface has a reddish-white tint, owing to the intermixture of white and red parts. The yellowish-white parts have the form of lines or veins, which, by their union with each other, assume a reticular form. Irregularly scattered over the surface we observe small star-like spots and depressions, of a darker colour. The transverse fracture is uneven, and presents numerous brownish-red or dark carmine-coloured undulating veins. The longitudinal fracture is still more uneven, and shows the longitudinal direction of the veins, which are often interrupted with white. The surface obtained by cutting is more or less yellow, and often exposes the veins, disposed in groups.

Fig. 173.

Crystals of Oxalate of Lime in Russian Rhubarb.

By boiling very thin slices of the root in water, and then submitting them to the microscope, we observe cellular tissue, annular ducts, and numerous *conglomerate raphides* (clumps of crystals of oxalate of lime). From 100 grains of Russian rhubarb, Mr. Quekett procured between 35 and 40 grains of these raphides (Lindley's *Introd. to Botany*, 3d ed. p. 553). Turpin considered the presence of these crystals sufficient to distinguish Russian and Chinese rhubarb from that grown in Europe; but in some specimens of English rhubarb I have met with these crystals in as great abundance as in foreign rhubarb. According to Raspail (*Chim. Organ.*) these crystals are situated in the interstices of the elongated cellular tissue; but this statement is erroneous, the situation of the crystals being in the interior of the cells.

The powder of Russian rhubarb is of a bright yellow colour, with a reddish tint; but, as met with in the shops, it is almost invariably mixed with the powder of English rhubarb.

White or *Imperial Rhubarb.*—When Pallas was at Kiachta, the Bucharian merchants who supplied the crown with rhubarb, brought some pieces of rhubarb as white as milk, with a sweet taste, and the same properties as rhubarb of the best quality (*Voyages*, t. iv. p. 218). It is not met with in English commerce as a distinct kind; and it is almost unknown in Russia (Grassmann, *Pharm. Central-Blatt für* 1831, S. 584). But in the chests of Russian rhubarb there are occasionally found pieces having an unusually white appearance: these I presume to be the kind alluded to. (Consult Gœbel and Kunze, *Pharm. Waarenkunde.*) White rhubarb is said to be the produce of *R. leucorrhizum*, Pallas (*R. nanum*, Sievers).

2. *Dutch-trimmed* or *Batavian Rhubarb*, offic. (*Rhubarbe de Perse*, Guibourt). This kind of rhubarb is closely allied to, if it be not identical with, the preceding in its texture. In commerce, however, it is always regarded as distinct. It is imported from Canton and Singapore in chests, each containing from 130 to 140 lbs. It is probably Bucharian rhubarb of less fine quality sent by way of Canton, as mentioned by Murray (*App. Med.* vol. iv. p. 379), and which, in consequence, has been usually confounded, by pharmacological writers, with Chinese rhubarb. In shape, size, and general appearance, it resembles the Russian kind; for the cortical portion of the root seems to have been separated by slicing, and hence the pieces have the same angular appearance on the surface that the Russian rhubarb has. The pieces are frequently perforated, and in the holes are found the remains of the cord by which the root has been suspended. In the drug-trade this kind of rhubarb is said to be *trimmed*, and, according to the shape of the pieces, they are called *flats* or *rounds*. The colour and weight of the pieces are variable.

3. *China* or *East Indian Rhubarb*, offic. (*radix rhei chinensis*, seu *indici*).—This kind is imported either directly from Canton, or indirectly by Singapore and other parts of the East Indies, and is probably the produce of China, (especially of the province of *Se-tchuen*; Du Halde: of *Hoo-nan* and *Hoo-pih*, as well as other provinces; Gutzlaffe and Reed). It is imported in chests. The pieces are frequently cylindrical or roundish, but sometimes flattened; in trade they are distinguished as *rounds* and *flats*. They appear to have undergone a different process of preparation to that of Russian rhubarb. Thus the cortical portion of the root seems rather to have been scraped than sliced off, and hence the surface is not so angular; and on the worst pieces we observe the remains of the greenish-brown or blackish cortex. Among druggists this kind of rhubarb is frequently termed *half-trimmed* or *untrimmed rhubarb*. The pieces are generally perforated with holes, in many of which we find portions of the cords by which the pieces were suspended. These holes are smaller than those observed in Russian rhubarb, and that portion of the root forming their sides is usually dark-coloured, decayed, and of inferior quality. The best pieces are heavier and more compact than those of the Russian kind; they are covered with an easily separable yellow dust. When this is removed we observe that the surface is not so regularly reticulated, is more of a yellowish-brown than reddish white colour, and has coarser fibres than Russian rhubarb. On the finer pieces we notice numerous star-like spots or depressions. The fracture is uneven; the veins, especially towards the middle, have a less determinate direction, and are of a duller or reddish-brown, and, in very bad pieces, of an umber-brown colour, with a gray substance between the veins.

The odour of this species is much less powerful than that of Russian rhubarb, and is somewhat less aromatic. The taste, grittiness when chewed, and microscopic appearances, are similar to those of Russian rhubarb. The colour of the powder is of a more dull yellow or brownish cast.

4. *Himalayan Rhubarb.*—This is the produce probably of Rheum Emodi, and Webbianum. The roots of R. spiciforme, and Moorcroftianum, are lighter coloured, and more compact in structure. My specimens were furnished by Dr. Wallich, who obtained them from the inhabitants of the Himalayas, who had strung the pieces around the necks of their mules. It has scarcely any resemblance to the officinal rhubarb. The pieces are cylindrical, and are cut obliquely at the extremities; the cortex of the root is not removed; the colour is dark brown, with a slight tint of yellow; they are without odour, and have a coarse fibrous texture. Dr. Royle (*Illustr. of the Bot. of the Himal. Mount.* p. 316) says that the Himalayan rhubarb makes its way into the plains of India through Kalsee, Almora, and Butan: it has, he adds, a spongy texture, and sells for only one-tenth of the price of the best rhubarb, resembling in quality the Russian, and which is found in India.

5. *English rhubarb* (*radix rhei anglici*).—Two kinds of rhubarb are met with in the shops under the name of English rhubarb: one is *dressed* or *trimmed*, so as to resemble the Russian kind, and is, I believe, the produce of Rheum palmatum; the other is sometimes called *stick* rhubarb, and is said by Messrs. Stephenson and Churchill (*Med. Bot.* vol. i.) to be obtained from Rheum undulatum; but I suspect this statement to be erroneous.

The *dressed English rhubarb* is the produce of Banbury, in Oxfordshire. It is the kind frequently observed in the show-bottles of druggists' windows, and is sometimes sold in Cheapside and the Poultry for "*Turkey rhubarb*," by persons dressed up as Turks. It occurs in various-sized and shaped pieces, which are trimmed and frequently perforated, so as to represent Russian rhubarb: some of the pieces are cylindrical in their form, and are evidently segments of cylinders; others are flat. This kind of rhubarb is very light, spongy (especially in the middle of the pieces), attractive of moisture, pasty under the pestle, and has a reddish or pinkish hue not observed in the Asiatic kinds. Internally it has usually a marbled appearance; the streaks are pinkish, parallel, and have a radiated disposition; and in the centre of some of the larger pieces the texture is soft and woolly, and may be easily indented by the nail. Its taste is astringent and very mucilaginous; it is not at all, or only very slightly, gritty under the teeth; its odour is feeble, and more unpleasant than either the Russian or East Indian kinds. The microscope discovers in it, for the most part, very few crystals of oxalate of lime.

The *common stick English rhubarb* is sold in herb shops. It occurs in angular or roundish pieces, of about five or six inches long, and an inch thick. When fractured it presents the radiated appearance, and the red-coloured streaks, of the kind last mentioned. Its taste is astringent, but very mucilaginous; it is not gritty under the teeth; it breaks very short.

English rhubarb is extensively employed by druggists to adulterate the powder of Asiatic rhubarb.

6. *French rhubarb* (*radix rhei gallici*).—This kind of rhubarb is procured from Rheum rhaponticum, undulatum, and especially compactum

(Guibourt, *Hist. des Drog.* t. i. p. 569). These are cultivated at Rheumpole, a place not far from Lorient, in the department of Morbihan. Rheum palmatum is no longer cultivated there. Through the kindness of Professor Guibourt, I possess two kinds of French rhubarb. One of these he calls *flat*, and is probably the produce of R. rhaponticum; the other he terms *round*, and is the produce of R. compactum.

Since the preceding remarks were set up in type, Mr. Anderson, of the Apothecaries' Botanic Garden, Chelsea, has kindly furnished me with the fresh roots of thirteen species of *Rheum*: viz. *R. palmatum, undulatum, compactum, Rhaponticum, Emodi, crassinervium, caspicum, tataricum, hybridum, confluens, Fischeri, bardanifolium,* and *bullatum.* Having carefully dried these by artificial heat, I found that one species only, viz. *R. palmatum*, closely resembled Asiatic rhubarb in the combined qualities of odour, colour, and marbling: *R. undulatum* agreed tolerably well in colour and marbling, but not in odour. It deserves, however, to be noticed that the specimens examined were of unequal ages,—some forming the rootstock, others rootbranches of the respective plants,—a circumstance which considerably diminishes the value of a comparative examination of them. Furthermore, all the samples were probably injured by the wet season. The rootbranches of *R. crassinervium* (from a strong plant of six or seven years old, but which has not flowered) did not resemble Asiatic rhubarb in either colour or odour. Dr. Royle has kindly supplied me with the dried roots of *R. Webbianum*, the same as those referred to in the experiments of Mr. Twining (*Trans. Med. and Phys. Soc. of Calcutta*, vol. iii. p. 441). They are short, transverse segments of the rootbranches, of a dark brownish colour, odourless or nearly so, with a very bitter and astringent taste, and do not essentially differ from the roots described at p. 814 as Himalayan rhubarb.

COMMERCE.—In 1831, the quantity of rhubarb imported from Russia was 6,901 lbs.; from the East Indies, 133,462 lbs. (*Parl Ret.* No. 550, for 1833). The quantities of rhubarb on which duty (1*s.* per lb.) has been paid during the last four years, is as follows (*Trade List*):—

——	East Indian.	Foreign.
	lbs.	*lbs.*
In 1835	32,515	10 647
1836	36,836	7,752
1837	44,669	5,946
1838	37,026	7,402

COMPOSITION.—The most important analyses of rhubarb are those of Schrader (Pfaff's *Mat. Med.* Bd. iii. S. 39), N. E. Henry (*Bull. de Pharm.* vi. 87), Brande (*Quart. Journ. of Science*, vol. x. p. 288), Hornemann (*Berl. Jahrb.* Bd. xxiii. S. 252, 1822), Peretti (*Journ. de Pharm.* xiv. 536), Buchner and Herberger (*Pharm. Central-Blatt für* 1831, S. 789), Lucae (*Ibid. für* 1834, S. 78), O. Henry (*Journ. de Pharm.* xxii. 402), and Brandes (*Pharm. Central-Blatt für* 1836, p. 482).

—	Hornemann's Analyses.			Lucae's Analysis.
	Russian.	English [Chinese?]	Sicilian [English?]	Rheum Emodi.
Bitter principle of Pfaff	16·042	14·375	10·156	4·220
Yellow colouring matter of Henry	9·583	9·166	2·187	7·500
Astringent extractive	14·687	16·458	10·417	6·458
Oxydized tannin	1·458	1·249	0·833	0·469
Mucilage	10·000	8·333	3·542	6·250
Substance extracted by potash ley	28·333	30·416	41·042	55·833
Oxalic acid	1·042	0·833	...	1·302
Woody fibre	14·583	15·416	8·542	16·364
Moisture	3·333	3·125	6·042	—
Rhaponticin	...	...	1·042	—
Starch	...	...	14·583	—
Loss [water and odorous matter?]	0·939	0·629	1·614	1·604
Rhubarb	100·000	100·000	100 000	100·000
The woody fibre being incinerated, yielded				
Potash	trace	trace	The quantities of potash, lime, alumina, and magnesia, were too small to be accurately determined.	—
Charcoal	0·208	0·208		0·208
Silica	2·416	0·416		0·155
Carbonate of magnesia	0·208	0·208		0·208
Alumina with oxide of iron	0·208	0·208		0·572
Carbonate of lime	5·833	7·083		3·854
Ashes	8·873	8·123	..	4·997

Brandes's Analysis.	
Chinese Rhubarb.	
Pure rhabarberic acid	2·0
Impure ditto	7·5
Gallic acid, with some rhabarberic acid	2·5
Tannin	9·0
Colouring extractive	3·5
Uncrystallizable sugar with tannin	11·0
Starch and pectic acid	4·0
Gummy extractive taken up by caustic potash	14·4
Pectic acid	4·0
Malate and gallate of lime	1·1
Oxalate of lime	11·0
Sulphate of potash, and chloride of potassium	1·5
Phosphate of lime with oxide of iron	0·5
Silica	1·0
Woody fibre	25·0
Water	2 0
	100·0

1. *Odorous matter of rhubarb* (*Volatile Oil?*)—In none of the analyses of rhubarb is any mention made of an odorous principle; yet such must exist. Professor Guibourt (*Hist. des Drog.* t. ii. p. 569, 3me éd.), however, ascribes the odour, colour, and taste of rhubarb to one and the same principle; but this opinion can scarcely be correct, since the degrees of colour and odour bear no proportion to each other in different kinds of rhubarb. The odorous principle is probably a volatile oil, but it has not hitherto been isolated. Dr. Bressy announced, a few years since, to the *Académie de Médecine*, that he had separated it, but the committee appointed to repeat his experiments was unable to procure it by his process (*Dict. des Drog.* t. iv. p. 425). Zenneck (*Pharm. Central-Blatt für* 1832, S. 237) says that the rhubarb odour is imitated by a mixture of nitric acid, aloes, and chloride of iron.

2. *Yellow colouring matter of rhubarb* (*Rhabarberic acid*, Brandes; *Rheumin*, Hornemann; *Rhabarberin*, Geiger; *Rhein*, Auctor.)—Extracted from rhubarb in powder by means of ether, and obtained by distilling off the greater part of the ether from the tincture thus procured, and leaving the residue to spontaneous crystallization. The crystals are purified by repeated solutions and crystallizations in alcohol. When dry, they assume the form of a powder, having an intensely yellow colour, but being without any remarkable taste. Rhabarberic acid is unchanged in the air; heated, it fuses into a yellow fluid, which, by a continuance of the heat, becomes reddish-brown, evolves dense yellow vapours [*pyro-rhabarberic acid?*], and carbonizes. It requires more than 1000 parts of cold water to dissolve it, but is twice as soluble in boiling water. It is more soluble in alcohol and in ether: the solutions redden litmus. In cold oil of almonds and in oil of turpentine it is slightly soluble; but is much more so when these liquids are hot. It dissolves, with a dark-red colour, in sulphuric and in nitric acids: water precipitates it from these solutions unchanged. Nitric acid attacks it with great difficulty. Alkaline solutions make it dark-red, and generally (lime-water excepted) dissolve it. Alum renders it dark-red. The alkaline solutions of it form, with acetate of lead, chloride of calcium, and chloride of barium, yellow precipitates; with sulphate of copper, violet, which, after some time, becomes blue (Brandes and Geiger, *Pharm. Central-Blatt für* 1834, S. 607). Brandes regards rhabarberic acid as the active principle of rhubarb. Six grains of the pure acid given to a strong young man caused griping, but did not purge (*Ibid. für* 1836, S. 498). Dulk is of opinion that the active principle of rhubarb is a difficultly crystallizable substance, which he terms *Rhein*, and which, by oxidation, becomes *Rhabarberic acid.* This acid, according to Brandes and Leber, consists of $C^{35} H^{19} O^{19}$ (*Pharm. Cent.-Blatt für* 1839, S. 102-105).

3. *Astringent matter* (*Tannic and Gallic Acids*).—The red veins are the seat of the astringent matter. This is proved by brushing the cut surface of rhubarb with a weak solution of a ferruginous salt: the red veins only undergo a change of colour. From the observations of Brandes, it appears that rhubarb contains gallic, as well as tannic, acid.

4. *Bitter principle.*—Rhubarb contains a bitter principle; but most of the substances which have been announced as the bitter principle of rhubarb, under the name of *caphopicrite* (? from καφέω, *to exhale*, and πικρὸς, *bitter*), or *rhabarberin*, are themselves compounded of two or more principles. Thus, *Pfaff's rhabarberin* consists of uncrystallizable sugar, extractive, resin, rhabarberic acid, and tannin. *Henry's rhabarberin* consists of resin and rhabarberic acid. *Buchner* and *Herberger's rhabarberin* is a mixture of extractive, uncrystallizable sugar, and rhabarberic acid. *Carpenter's rhabarberin* contains some rhabarberic acid (Brandes, *Pharm. Cent.-Blatt für* 1836, S. 498). It would appear from the analysis of Brandes that the bitter principle is of the nature of resin; but Buchner (*Pharm. Central-Blatt für* 1837, S. 821) admits the existence of a bitter extractive (caphopicrite), which is soluble in water and alcohol, but is insoluble in ether. This extractive, he says, is in intimate combination with rhabarberic, tannic, and gallic acids; the compound thus formed being the resin of some chemists. It is obvious, therefore, that a further examination of the bitter matter is required to make out satisfactorily its nature.

5. *Rhaponticin.*—A yellow, crystallizable, odourless, tasteless substance, obtained from the root of European [English?] rhubarb. It is insoluble in cold water, ether, and the volatile oils, but soluble in 24 times its weight of boiling water, and twice its weight of absolute alcohol (Berzelius, *Traité de Chim.* vi. 205).

6. *Oxalate of lime.*—The conglomerate raphides before noticed (p. 812) are crystals of oxalate of lime. They may be separated in great abundance by boiling Russian or China rhubarb in water until the cohesion of the tissue is completely destroyed. When the decomposed tissue is well shaken with water, the crystals fall to the bottom of the vessel. Heated to redness, they are changed into carbonate of lime. A solution of them in diluted nitric acid, or a solution obtained by boiling the crystals with a solu-

tion of carbonate of soda, forms, with nitrate of silver, a white precipitate (*oxalate of silver*), which explodes when heated.

Chemical Characteristics.—If the powder of rhubarb be heated in a glass capsule over a lamp, an odorous yellow vapour (*rhabarberic* or *pyro-rhabarberic acid*) is obtained, which communicates a red colour to a solution of caustic potash. The aqueous infusion of rhubarb forms, with the sesquichloride of iron, a green compound (*tannate of iron*); with a solution of gelatin, a copious yellow precipitate (*tannate of gelatin*), which is dissolved on the application of heat, or by the addition of an excess of gelatin; with a solution of sulphate of quina, a yellowish precipitate (*tannate of quina*); with the alkalies (potash, soda, and ammonia) a red-coloured solution (*soluble alkaline rhabarberates*); with lime-water, a reddish precipitate (*rhabarberate of lime*); with the acids (the acetic excepted), precipitates (composed of *rhabarberic acid and the precipitant*); and with various metallic solutions (as of acetate of lead, protochloride of tin, protonitrate of mercury, and the nitrate of silver), precipitates (principally *metallic rhabarberates* and *tannates*).

Paper coloured by rhubarb is not affected by boracic acid, or by the borates rendered acid; whereas turmeric paper is reddened by these agents (Faraday, *Quart. Journ. of Science*, vol. vi. p. 152). A decoction of Russian, Dutch-trimmed, or of China rhubarb, becomes, with a solution of iodine, greenish-blue (*iodide of starch*): after a few minutes the colour disappears, and no iodine can be detected in the liquor by starch, unless nitric acid be previously added. A decoction of English rhubarb is rendered, by a solution of iodine, intensely blue (*iodide of starch*), the colour not completely disappearing by standing.

Physiological Effects. (*a.*) *On animals.*—On the *Solipedes* rhubarb acts as a tonic, confining its action principally to the stomach, whose digestive power it augments. On the *Carnivora* it operates, in doses of half a drachm, in the same way; but, in doses of several drachms, as a purgative. On the larger *Herbivora* it may be given to the extent of several ounces without causing purgation (Moiroud, *Pharm. Vétér.* p. 260). Tiedemann and Gmelin (*Versuche ü. d. Wege auf welch. Subst. aus d. Magen u. Darmk. gelang.* S. 10-12) detected it by its yellow colour in the serum of the blood of the mesenteric, splenic, and portal veins, and in the urine of dogs, to which rhubarb had been administered by the mouth. They failed to recognise it in the chyle.

(*b.*) *On man.*—*In small doses* (as from four to eight grains) it acts as an astringent tonic, its operation being principally or wholly confined to the digestive organs. In relaxed conditions of these parts it promotes the appetite, assists the digestive process, improves the quality of the alvine secretions, and often restrains diarrhœa. *In large doses* (as from a scruple to a drachm) it operates, slowly and mildly, as a purgative sometimes causing slight griping. It never inflames the mucous membrane of the alimentary canal, as jalap, scammony, colocynth, and some other drastic purgatives are capable of doing. The constipation which follows its cathartic effect has been ascribed to the operation of its astringent matter. In febrile complaints and inflammatory diseases it sometimes accelerates the pulse, and raises the temperature of the body, whence the impropriety of its use in these cases. Its yellow colouring matter (rhabarberic acid) becomes absorbed, and may be recognised in the urine, by the yellow stain which this secretion produces on linen, and by the red colour which it assumes on the addition of potash. By a more prolonged use of rhubarb the sweat (especially of the armpits) becomes tinged yellow. The milk of nurses who have taken it, acquires a purgative property. Rhubarb has for a long period been considered to possess a specific influence over the liver, to promote the secretion of bile, and to be useful in jaundice. These opinions, which, as Dr. Cullen (*Mat. Med.*) correctly observed, have no foundation either in theory or practice, arose from the absurd doctrine of signatures.

Considered in relation to other medicinal agents, rhubarb holds an intermediate rank between the bitter tonics on the one hand, and the drastics on the other. From the first it is distinguished by its purgative properties; from the latter, by its tonic operation and the mildness of its evacuant effects. As a purgative it is perhaps more closely allied to aloes than to any other cathartic in ordinary use; but is distinguished by its much milder operation, and its want of any specific action on the large intestines.

The comparative power of the several kinds of rhubarb has scarcely been ascertained with precision. The remarks above made apply to the Russian and Chinese varieties, whose power is about equal. From experiments made by Dr. Parry, at the Bath Hospital, it appears that the purgative qualities of English rhubarb are scarcely so strong as those of the Russian and Chinese varieties; but the difference is not great (Stephenson and Churchill, *Med. Bot.*) Himalayan rhubarb is, according to Dr. Twining (*Trans. Med. and Phys. Soc. of Calcutta*, vol. iii. p. 441) almost equal to Russian rhubarb in its purgative effects; but it is less aromatic, though more astringent.

Uses.—The remedial value of rhubarb depends on the mildness and safety of its operation, and on its tonic and astringent influence over the alimentary canal.

1. *As a purgative.*—There are many cases in which the above-mentioned qualities render rhubarb peculiarly valuable as a purgative. In mild cases of *diarrhœa* it sometimes proves peculiarly efficacious; by first evacuating any irritating matter contained in the bowels, and afterwards acting as an astringent. Given at the commencement of the disease, it is a very popular remedy; and though doubtless it is often employed unnecessarily (since, as Dr. Cullen has justly observed, in many cases no further evacuation is necessary or proper than what is occasioned by the disease) yet it rarely if ever does harm. Sulphate of potash is a very useful adjunct to it, and promotes its purgative operation. Antacids (as chalk or magnesia) are frequently conjoined with it. It is not fitted for inflammatory or febrile cases. As *an infant's purgative* it is deservedly celebrated. It is well adapted for a variety of children's complaints; but is peculiarly suited to scrofulous subjects, and those afflicted with enlargement of the mesenteric glands, accompanied with tumid belly and atrophy. Magnesia, sulphate of potash, or calomel, may be associated with it according to circumstances. *For an ordinary purgative in habitual costiveness* it is scarcely adapted, on account of the constipation which follows its purgative effect.

2. *As a stomachic and tonic.*—In *dyspepsia*, accompanied with a debilitated condition of the digestive organs, small doses of rhubarb sometimes prove beneficial, by promoting the appetite and assisting the digestive process. In *scrofulous* enlargement of the lymphatic glands, in

children, rhubarb, in small doses, is often combined with mercurial alteratives (as the *hydrargyrum cum cretâ*), or with antacids (as magnesia or chalk), and frequently with apparent advantage.

3. *As an external application.*—Sir Everard Home (*Pract. Observ. on the Treatment of Ulcers*, p. 96, 1801) used it as topical application to promote the healing of indolent, non-painful ulcers. The powder is to be lightly strewed over the ulcer and a compress applied. In irritable ulcers an eighth part of opium is to be added. When applied to large ulcers it has produced pretty active purging (Arnemann, *Chirurg. Arzneim.* 6ste Aufl. S. 224). The powder of rhubarb, incorporated with saliva and rubbed on the abdomen, proves purgative (Alibert, *Nouv. Elém. de Thérap.* t. ii. p. 275 et seq. 5me éd.)

Administration.—The powder of Russian or China rhubarb may be exhibited, as a stomachic and tonic, in doses of from five to ten grains; as a purgative, from a scruple to a drachm. The dose of indigenous rhubarb should be about twice as much as the above.

1. *Infusum Rhei*, L. E. D.—(Rhubarb, sliced [in coarse powder, *E.*] ʒiij. [℥j. *E.* ʒj. *D.*]; Boiling [distilled, *L.*] Water, Oj. [Oss. *D.* f℥xviij. *E.*] [Spirit of Cinnamon, fʒij. *E.*] Macerate for two hours in a lightly-covered vessel, and strain [through linen or calico, *E.*]). Boiling water extracts from rhubarb, rhabarberic acid, resin, tannin, gallic acid, sugar, extractive, and starch. As the liquor cools it becomes turbid, owing to some rhabarberic acid, resin, tannin, gallic acid, and tannate of starch, being deposited (Brandes). Infusion of rhubarb is stomachic and gently purgative. It is usually employed as an adjunct to, or vehicle for, other mild purgatives or tonics. The alkalies or magnesia are sometimes conjoined. The stronger acids and most metallic solutions are incompatible with it. Dose, f℥j. to f℥ij.

2. *Tinctura Rhei*, E.—(Rhubarb, in moderately fine powder, ℥iij.; Cardamom Seeds, bruised, ʒss.; Proof Spirit, Oj. and ℥xvj. Mix the rhubarb and cardamom seeds, and proceed by the process of percolation as directed for tincture of cinchona. This tincture may also be prepared by digestion). The alcoholic tincture of rhubarb contains rhabarberic acid, impure rhabarberic acid (resinous yellow colouring matter of rhubarb), tannin, semi-resin, and uncrystallizable sugar (Brandes). Cordial, stomachic, and mildly purgative. Dose, as a stomachic, fʒj. to f℥iij.; as a purgative, f℥ss. to f℥j.

3. *Tinctura Rhei composita*, L. D.—(Rhubarb, sliced, ℥ijss. [℥ij. *D.*]; Liquorice, bruised, ʒvj. [℥ss. *D.*]; Saffron, ʒiij. [ʒij. D.], [Ginger, sliced, ʒiij. *L.*], Proof Spirit, Oij. [wine measure, *D.*] Macerate for fourteen [seven, *D.*] days, and strain). Cordial, stimulant, stomachic, and mildly purgative. A popular remedy in various disordered conditions of the alimentary canal, especially at the commencement of diarrhœa, also in flatulent colic. It is a very useful adjunct to purgative mixtures, in cases in which the use of a cordial and stomachic cathartic is required. Dose, as a stomachic, fʒj. to fʒiij.; as a purgative, fʒss. to f℥jss.

4. *Tinctura Rhei et Aloes*, E.—(Rhubarb, in moderately fine powder, ℥x.; Socotrine or East Indian Aloes, in moderately fine powder, ℥vj.; Cardamom Seeds, bruised, ʒss.; Proof Spirit, Oj. and f℥xvj. Mix the powders, and proceed as for the tincture of Cinchona). A cordial and stomachic purgative, in doses of from f℥ss. to f℥j.

5. *Tinctura Rhei et Gentianæ*, E.—(Rhubarb, in moderately fine powder, ℥ij.; Gentian, finely cut or in coarse powder, ʒss.; Proof Spirit

Oj. and f℥xvj. Mix the powders, and proceed as directed for tincture of Cinchona). Stomachic, tonic, and feebly purgative. Dose, as a tonic, fʒj. to fʒiij.; as a very mild purgative, f℥ss. to f℥j.

6. *Vinum Rhei*, E. — (Rhubarb, in coarse powder, ℥ij.; Canella, in coarse powder, ʒj.; Proof Spirit, f℥ijss.; Sherry, f℥xvjss. Digest for seven days, strain, express strongly the residuum, and filter the liquors). Cordial, stomachic, and mildly purgative. Used in the same cases as the *compound tincture of rhubarb.* Dose, as a stomachic, fʒj. to fʒiij.; as a purgative, f℥ss. to f℥j.

7. *Extractum Rhei*, L. E.—(Rhubarb, powdered, ℥xv.; Proof Spirit, Oj.; Distilled Water, Ovij. Macerate for four days with a gentle heat, afterwards strain, and set by, that the dregs may subside. Pour off the liquor, and evaporate it, when strained, to a proper consistence, *L.*—The process of the *Edinburgh College* is as follows:—Take of Rhubarb, lb. i.; Water, Ov. Cut the rhubarb into small fragments; macerate it for twenty-four hours in three pints of the water; filter the liquor through a cloth, and express it with the hands or otherwise moderately; macerate the residuum with the rest of the water for twelve hours at least; filter the liquor with the same cloth as before, and express the residuum strongly. The liquors, filtered again, if necessary, are then to be evaporated together to a proper consistence in the vapour-bath. The extract, however, is obtained of finer quality by evaporation in a vacuum with a gentle heat).

The principles extracted from rhubarb by water and spirit have been already noticed (p. 820). The Edinburgh College, it will be observed, employ no spirit in the above process. Great care is required in the preparation of this extract, as both the purgative and tonic properties of rhubarb are very apt to become deteriorated by the process. I have some extract prepared *in vacuo* more than twenty years ago, which still preserves the proper odour and flavour of rhubarb. The dose of extract of rhubarb, as a purgative, is from gr. x. to ʒss.

8. *Pilulæ Rhei*, E. — (Rhubarb, in fine powder, ℥i.; Acetate of Potash, ʒi.; Conserve of Red Roses, ʒvss. Beat them into a proper mass, and divide it into one hundred and forty-four pills). Stomachic and purgative. The acetate of potash is employed, I presume, to prevent the pills becoming hard by keeping. Each pill contains nearly three and a half grains of rhubarb.

9. *Pilulæ Rhei compositæ*, L. E.—(Rhubarb, powdered, ℥i. [℥ss. *E.*]; Aloes, powdered, ʒvi. [ʒiiij. *E.*]; Myrrh, powdered, ℥ss. [ʒij. *E.*]; Soap, ʒi. [ʒij. *E.*]; [Oil of Caraway, fʒss. *L.*]; Syrup, q. s. [Conserve of Red Roses, ʒij. ℈j. *E.*] Mix them, and beat them into a proper mass, and divide this into one hundred and forty-four pills). Tonic and mildly purgative. Dose, ℈i. or four pills.

10. *Pilulæ Rhei et Ferri*, E.—(Dried Sulphate of Iron, gr. xxiv.; Extract of Rhubarb, ʒi.; Conserve of Red Roses, about ʒss. Beat them into a proper pill mass, and divide it into twenty-four pills). Tonic. Dose, two to four pills.

11. *Pulvis Rhei compositus*, E.—(Magnesia, lb. i.; Ginger, in fine powder, ℥ii.; Rhubarb, in fine powder, ℥iv. Mix them thoroughly, and preserve the powder in well-closed bottles). A very useful antacid and mild stomachic purgative, especially adapted for children. Dose, for adults, ℈i. to ʒss.; for children, gr. v. to gr. x.

Ru'mex Aceto'sa, Linn. L. D.—*Common Sor'rel.*

Sex. Syst. Hexandria, Trigynia.

(Folia, *L. D.*)

Botany. *Gen. Char.*—*Calyx* six-parted; the three outer segments somewhat cohering at the base; the three inner becoming enlarged after flowering. *Stamens* six. *Styles* three, reflexed. *Stigmas* three, cut. *Nut* with three sharp angles. *Embryo* on one side. *Radicle* superior (*Bot. Gall.* for the most part).

Sp. Char.—*Flowers* diœcious. *Leaves* oblong, arrow-shaped. *Permanent petals* tuberculated (Smith).

Hab. — Indigenous. Woods and pastures common. Perennial. Flowers in June.

Description.—Sorrel leaves have an agreeable, acid, slightly astringent taste.

Composition.—I am unacquainted with any analysis of this plant. The leaves are composed of *binoxalate of potash*, *tartaric acid*, *mucilage*, *fecula*, *chlorophylle*, *tannic acid*, and *woody fibre.*

Physiological Effects.—Slightly nutritive. Refrigerant and diuretic. Esteemed antiscorbutic.

Uses.—Employed as a pot-herb and salad: from the latter use of it, it has been termed *green-sauce* (Withering, *Bot.* vol. ii.) Rarely applied medicinally. A decoction of the leaves may be administered in whey, as a cooling and pleasant drink in febrile and inflammatory diseases. In some parts of Scandinavia, bread is made of it in times of scarcity (Clarke, *Travels in Scandinavia*, Part III. S. 2, P. 90, 1823). Laugier has suggested that the use of aliments containing oxalic acid may, under some circumstances, dispose to the formation of mulberry calculi.

Ru'mex Hydrolap'athum, Hudson.—*Great Water Dock.*

Rumex aquaticus, *D.*

Sex. Syst. Hexandria, Trigynia.

(Radix, *D.*)

Botany. *Gen. Char.*—See *Rumex Acetosa.*

Sp. Char.—*Permanent petals* ovate-oblong, nearly entire, unequally tuberculated. *Leaves* lanceolate, acute at each end. *Whorls* rather crowded, almost entirely leafless (Smith).

Hab.—Indigenous. Ditches and river sides. Perennial. Flowers in July and August.

Description.—The herb and root were formerly used under the name of *herba et radix britannicæ.* The root is inodorous, but has an acrid bitter taste.

Composition.—I am unacquainted with any analysis of the plant. The root contains *tannic acid.*

Physiological Effects.—The root is astringent, and is reputed antiscorbutic.

Uses.—Scarcely employed. Has been exhibited internally in scurvy, skin diseases, and rheumatism. The powdered root has been used as a dentrifice; the decoction of the root as an astringent gargle for ulcerated or spongy gums.

Polyg'onum Bis'tor'ta, Linn. D.—*Great Bis'tort* or *Snake-weed.*

Sex. Syst. Octandria, Trigynia.

(Radix, D.)

Botany. *Gen. Char.*—*Calyx* four to six partite, persistent. *Stamens* five to nine, generally eight. *Ovary* with two to three *styles*, and as many *stigmas*. *Cariopsis* or *nut* ovate or triangular. *Embryo* lateral or central; the radicle superior (*Bot. Gall.*)

Sp. Char.—*Stem* simple, with a single, spiked, cluster of flowers. *Leaves* ovate, wavy, running down into the footstalks (Smith).—*Flowers* rose-coloured.

Hab.—Indigenous. Meadows. Perennial. Flowers in June.

Description.—Bistort root (*radix bistortæ*) is twice bent on itself: hence its name from *bis*, twice; and *torta*, twisted or bent. It is rugous and brown externally; reddish internally; almost inodorous; it has an austere, strongly astringent taste.

Composition.—This root has not been analyzed. The principal constituents are *tannic acid, starch, oxalate of lime, colouring matter*, and *woody fibre.*

Physiological Effects.—The local effect is that of a powerful astringent, depending on the tannic acid which it contains; its remote effects are those of a tonic. (Vide pp. 79, 80.) The presence of starch renders the root nutritive: hence in Siberia it is roasted and eaten.

Uses.—It is but little employed. A decoction of the root is sometimes applied as an astringent injection in leucorrhœa and gleet; as a gargle in spongy gums and relaxed sore throat; and as a lotion to ulcers attended with a profuse discharge.

Internally it has been employed, in combination with gentian, in intermittents. It has also been used as an astringent in passive hemorrhages and chronic alvine fluxes.

Administration.—The dose of the powder is from ℈j. to ʒss. The decoction (prepared by boiling ℥ij. of the root in Ojss. of boiling water) may be administered in doses of from f℥j. to f℥ij.

Other Medicinal or Dietetical Polygonaceæ.

Fig. 174.

Polyg'onum Fagopy'rum.

Fig. 175.

P. tatar'icum.

Fig. 176.

P. emargina'tum.

Polyg'onum Fagopy'rum, or *Buck-wheat*, is cultivated in this country on account of its seeds, which are used as food for poultry and horses. In China, and some other parts of Asia, they are employed as a bread-corn for the sustenance of man. *P. tatar'icum* is also applied to the same purposes. In Nepal *P. emargina'tum* is cultivated.

An extract prepared from the bark of *Coccolo'ba uvi'fera*, or the *Sea-side Grape*, a native of the West Indies, has been used under the name of *Jamaica Kino*.

Order 32. Chenopodia'ceæ, *Lindley*.—The Goose-foot Tribe.

Atriplices, *Jussieu*.—Chenopodeæ, *Ventenat*.

The substance called *barilla* (impure carbonate of soda), described in the first part of this work (p. 323), is obtained by the combustion of plants belonging to the genera *Salicornia*, *Salsola*, and *Chenopodium*. None of the Chenopodiaceæ are employed in this country. Some few are used as pot-herbs or salads, as Spinach (*Spina'cia olera'cea*) and Beet (*Be'ta vulga'ris*).

Order 33. Labia'tæ, *Jussieu*.—The Mint Tribe.

Lamiaceæ, *Lindley*.

Essential Character.—*Calyx* tubular, inferior, peristent, the odd tooth being next the axis; regular five- or ten-toothed, or irregular bilabiate or three- to ten-toothed. *Corolla* monopetalous, hypogynous, bilabiate; the lesser lip undivided or bifid, overlapping the lower, which is larger and three-lobed. *Stamens* four, didynamous inserted upon the corolla, alternately with the lobes of the lower lip, the two upper sometimes wanting; anthers two-celled; sometimes apparently unilocular in consequence of the confluence of the cells at the apex; sometimes one cell altogether obsolete, or the two cells separated by a bifurcation of the connective. *Ovary* deeply four-lobed, seated in a fleshy hypogynous disk; the lobes each containing one erect ovule; *style* one, proceeding from the base of the lobes of the ovary; *stigma* bifid, usually acute. *Fruit* one to four small nuts, enclosed within the persistent calyx. *Seeds* erect, with little or no albumen; *embryo* erect; *cotyledons* flat.—*Herbaceous* plants or *under-shrubs*. *Stem* four-cornered, with opposite ramifications. *Leaves* opposite, divided or undivided, without stipules, replete with receptacles of aromatic oil. *Flowers* in opposite, nearly sessile, axillary cymes, resembling whorls; sometimes solitary, or as if capitate (Lindley).

Fig. 177.

Bilabiate flower.

Properties.—The medicinal activity of the plants of this family depends on volatile oil, bitter extractive, and astringent matter.

The *volatile oil* resides in small receptacles (by some called *globular glands*) contained in the leaves. "These glands are placed quite superficially, or rather in depressed points, and are commonly of a shining yellow colour. We may regard them as oleo-resinous matter separated from glands lying on the under surface. When macerated in strong spirit of wine they remain unchanged, and appear under the microscope as transparent, probably cellular, vesicles, filled with a yellow granular matter" (Nees and Ebermaier, *Handb. d. Med.-Pharm. Bot.* Th. i. S. 524). The oils of labiate plants, like other volatile oils, consist of *éléoptène* and *stéaroptène*: it is the latter substance which is described by some chemists as camphor.

The *bitter extractive* is found, in greater or less quantity, in all the Labiatæ. It is this principle which communicates the bitterness to the watery infusions of these plants.

The presence of *astringent matter* is shewn by the green colour produced when a ferruginous salt is added to the infusion of some of the Labiatæ.

The volatile oil gives to these plants aromatic, carminative, and slightly stimulant properties. The bitter extractive renders them tonic and stomachic. The astringent matter is usually in too small a quantity to communicate much medicinal activity, though it must contribute to the tonic operation.

The perfumer uses some labiate plants on account of their fragrant odour; the cook employs others for their flavour and condimentary properties; the medical practitioner administers them to relieve nausea and colicky pains, to expel wind, to cover the taste of nauseous medicines, and to prevent or relieve griping pains.

Lavan'dula ve'ra, Decand. E.—*Common* or *Garden Lav'ender.*

Lavandula angustifolia, *Ehrenberg.*—Lavandula Spica, *L. D.*

Sex. Syst. Didynamia, Gymnospermia.

(Flores, *L. D.*—The flowering heads; and volatile oil of ditto, *E.*)

History.—No plant is mentioned, under the name of Lavender, by Hippocrates, Theophrastus, Dioscorides, or Pliny. It is not improbable, however, that lavender may be alluded to, under some other name, by one or more of these authors; but it is impossible now to identify it with any certainty. Sprengel (*Hist. Rei Herb.* t. i. p. 96) declares, on the authority of Hesychius, that the ἴφυον of Theophrastus (*Hist. Plant.* lib. vi. cap. 6) is Lavandula Spica.

Botany. *Gen. Char.*—*Calyx* tubular, nearly equal, thirteen or rarely fifteen-ribbed, shortly five-toothed, with the four lower teeth nearly equal, or the two lower narrower; the upper either but little broader than the lateral ones, or expanded into a dilated appendage. Upper lip of *corolla* two-lobed; lower three-lobed; all the divisions nearly equal. *Stamens* didynamous, declinate. *Filaments* smooth, distinct, not toothed. *Anthers* reniform, one-celled (Condensed from Bentham; Lindley).

Sp. Char.—*Leaves* oblong-linear or lanceolate, quite entire, when young hoary and revolute at the edges. *Spikes* interrupted. *Whorls* of six to ten flowers. *Floral leaves* rhomboid-ovate, acuminate, membranous, all fertile, the uppermost shorter than the calyx. *Bracts* scarcely any (Bentham).—*Shrub*, one to two feet high. *Flowers* purplish-gray.

Lavandula Spica, Decand. (*L. latifolia*, Villars) or *French Lavender*, formerly considered as a variety only of the preceding species, is not used in medicine. It is distinguished by its lower habit, whiter colour, the leaves more congested at the base of the branches, the spike denser and shorter, the floral leaves lanceolate or linear, and the presence of bracts (Bentham). It yields by distillation *oil of spike* (*oleum spicæ*) sometimes called *foreign oil of lavender*, or, in order to distinguish it from the oil of *Lavandula Stæchas*, the *true oil of spike* (*oleum spicæ verum*). This oil is distinguished from the genuine oil of *Lavandula vera* by its darker green colour, and its less grateful odour. It is used by painters on porcelain, and by artists in the preparation of varnishes.

Hab.—South of Europe. Extensively cultivated at Mitcham, in Surrey, from which place the London market is principally supplied.

Properties.—Lavender flowers have a bluish-gray colour, a pleasant odour, and a pungent bitter taste. The flowering stems are collected in June or July, dried in the shade, and made up into bundles for sale. A cold infusion of the flowers is deepened in colour (*tannate of iron*) by sesquichloride of iron.

Composition.—The principal constituents of the flowers are *volatile oil*, *resin? tannic acid*, a *bitter principle*, and *woody fibre*.

Oil of Lavender (*English Oil of Lavender; Oleum Lavandulæ veræ*) has a pale yellow colour, a hot taste, and a very fragrant odour. Its sp. gr. varies from 0·877 to 0·905; the lightest oil being the purest. It boils at 365° F.; and is composed, according to Mr. Kane, of $C^{12}\ H^{10}\ O$. One pound of oil is obtained from fifty to seventy pounds of the flowers. When the stalks and leaves are distilled with the flowers, the odour of the oil is considerably deteriorated (Brande's *Dict. of Mat. Med.* p. 337-8).

Physiological Effects.—The flowers are carminative, mildly stimulant, and somewhat tonic. Kraus (*Heilmittell.* p. 473) says, that when taken internally, they cause *tormina ventris*.

Uses.—Lavender flowers are sometimes employed as errhines. They enter into the composition of the *pulvis asari compositus*, D. (p. 781). The following are the officinal preparations, with their uses, of lavender flowers:—

1. *Oleum Lavandulæ*, L. E. D.; *Oleum Lavandulæ veræ: English Oil of Lavender*, offic.—(Prepared by submitting lavender flowers to distillation with water). Its physical and chemical properties have been already described. It is stimulant and stomachic, and is sometimes given in hysteria and headache; but is more commonly employed as a perfume for scenting evaporating lotions, ointments, liniments, &c. Dose, gtt. ij. to gtt. v.

2. *Spiritus Lavandulæ*, L. E. D.—(Fresh Lavender, lb. ijss. [lb. ij. *D.*]; Rectified [Proof, *D.*] Spirit, *Cong.* j.; [Water, Oij. *L.* sufficient to prevent empyreuma, *D.*] Mix them [macerate for twenty-four hours, *D.*]; then, with a slow fire, [the heat of a vapour bath, *E.*] let a gallon [seven pints, *E.* five pints, *D.*] distil). The dried flowers may be substituted for the fresh ones. Druggists frequently prepare this compound by dissolving a few drops of oil of lavender in a fluidounce of rectified spirit. Employed only in the preparation of the *Linimentum Camphoræ compositum* (p. 798) and the *Tinctura Lavandulæ composita*.

The fragrant perfume sold in the shops, under the name of *Lavender Water*, is a solution of the oil of lavender and of other odoriferous substances in spirit. There are various formulæ for its preparation, scarcely two manufacturers adopting precisely the same one. The following yields a most excellent product:—Oil of Lavender, Oil of Bergamot, aa. f ʒiij; Otto of Roses, Oil of Cloves, aa. gtt. vj.; Musk, gr. ij.; Oil of Rosemary, f ʒj.; Honey, ℥j.; Benzoic Acid, ℈ij.; Rectified Spirit, Oj.; Distilled Water, ℥iij. Mix, and, after standing a sufficient time (the longer the better), filter. This agreeable perfume may be employed for scenting spirit washes, &c. but is principally consumed for the toilette.

3. *Tinctura Lavandulæ composita*, L.; *Spiritus Lavandulæ compositus*, E. D.: *Lavender Drops* or *Red Lavender Drops*, offic.—(Spirit of Lavender, Oiss. [Oij. & f℥vij. *E.* Oiij. *D.*]; Spirit of Rosemary, Oss. [f℥xvj. *E.* Oj. *D.*]; Cinnamon, bruised, ʒijss. [℥j. *E.* ℥ss. *D.*]; Nutmeg, bruised, ʒijss. [℥ss. *E. D.*]; [Cloves, ʒij. *E. D.*]; Red Sandal [Saunders, offic.] Wood, raspings, ʒv. [ʒiij. *E.* ℥j. *D.*] Macerate for fourteen [seven, *E.* ten, *D.*] days, and filter [through calico, *E.*] Stimulant, cordial, and stomachic. Employed to relieve gastric uneasiness, flatulence, low spirits, languor, faintness, &c. A favourite remedy with hysterical and hypochondriacal persons. Dose, from fʒss. to fʒij. administered in water or on sugar. The red Saunders' wood is merely a colouring ingredient.

Men'tha vir'idis, Linn. L. E. D.—*Spearmint.*

Sex. Syst. Didynamia, Gymnospermia.

(Herba, *D.*—Herb, *E.*)

History.—Hippocrates employed in medicine a plant which he terms Μίνθη (p. 359, &c. ed. Fæs.); but it is uncertain what particular species he referred to. On account of its agreeable odour it was also called Ἡδύοσμον (from ἡδυς, *sweet*; and ὀσμή, *smell*), a name by which Dioscorides (lib. iii. cap. 41) designates it. Strabo tells us that *Minthe* was a concubine of Pluto, and that she was changed by Proserpine into a plant, which was called after her. Ovid (*Metamorph.* lib. x. ver. 729) also alludes to this fable.

Botany.—*Calyx* campanulate or tubular, five-toothed, equal or somewhat two-lipped, with the throat naked inside or villous. *Corolla* with the tube enclosed, the limb campanulate, nearly equal, four-cleft: the upper segment broader, nearly entire or emarginate. *Stamens* four, equal, erect, distant; *filaments* smooth, naked; *anthers* with two parallel cells. *Style* shortly bifid, with the lobes bearing stigmas at the points. *Achenia* dry, smooth (Bentham).

Fig. 178.

a, *Mentha piperita.*
b, *Mentha Pulegium.*
c, *Mentha viridis.*

Sp. Char.—*Stem* erect, smooth. *Leaves* subsessile, ovate-lanceolate, unequally serrated, smooth; those under the flowers all bract-like, rather longer than the whorls; those last and the calyxes hairy or smooth. *Spikes* cylindrical, loose. *Whorls* approximated, or the lowest or all of them distant (Bentham).—Creeping-rooted.

Hab.—Marshy places. Indigenous. A native of the milder parts of Europe; also of Africa and America. Perennial. Flowers in August. Selected for medicinal use when about to flower.

Properties.—The whole herb, called *green-mint* or *spearmint* (*herba menthæ viridis*), is employed in medicine. It has a strong but peculiar odour, and an aromatic, bitter taste, followed by a sense of coldness when air is drawn into the mouth. Sesquichloride of iron communicates a green colour (*tannate of iron*) to the cold watery infusion.

Composition.—Its odour and aromatic qualities depend on *volatile oil.* It also contains *tannic acid*, *resin?* a *bitter principle*, and *woody fibre.*

Oil of Spearmint (*Oleum Menthæ viridis*) is of a pale yellowish colour, but becomes reddish by age. It has the odour and taste of the plant, and is lighter than water. It boils at 320° F.; and is composed, according to Mr. Kane, of $C^{35} H^{28} O$, or of $3\frac{1}{2} (C^{10} H^{8}) + O$. The average produce of the essential oil is not more than 1-500th of the fresh herb (Brande, *Dict. Mat. Med.* p. 328).

Physiological Effects.—Aromatic, carminative, mildly stimulant and tonic. Feebler than peppermint. Said, though without sufficient foundation, to check the secretion of milk, and to act as an emmenagogue (Linnæus, in Murray's *App. Med.* vol. ii. p. 180-1).

Uses.—Employed as a salad and sweet herb. In medicine it is principally used as a flavouring ingredient, and to alleviate or prevent colicky pains. The following are its officinal preparations, with their uses:—

1. *Infusum Menthæ simplex*, D.; *Spearmint Tea.*—(Spearmint leaves, dried, ʒij.; Boiling Water, a sufficient quantity to afford six ounces of strained liquor). Stomachic and carminative. Used in irritable conditions of the stomach; but is ordinarily a vehicle for other remedies. Dose, f℥j. to f℥ij. or *ad libitum.*

2. *Infusum Menthæ compositum*, D.—Spearmint leaves, dried, ʒij.; Boiling Water, a sufficient quantity to afford six ounces of strained liquor. Digest for half an hour in a covered vessel, and, when the liquor

has grown cold, strain; then add Refined Sugar, ʒij; Oil of Spearmint, gtt. iij. dissolved in Compound Tincture of Cardamoms, ℥ss. Mix.) A grateful stomachic, slightly stimulant, and diaphoretic. Employed to allay nausea and vomiting, and to cover the taste of disagreeable medicines. Dose, f℥j. to f℥ij.

3. *Oleum Menthæ viridis*, L. E. D.—(Obtained by submitting the fresh herb to distillation with water). The chemical properties of this oil have been before described. It is carminative and stimulant. Dose, gtt. ij. to gtt. v. rubbed with sugar and a little water.

4. *Spiritus Menthæ viridis*, L. D.—(Oil of Spearmint, ʒiij. [by weight, ℥ss. *D.*]; Proof [Rectified, *D.*] Spirit, *Cong.* j. [wine measure, *D.*]; Water, Oj. [as much as may be sufficient to prevent empyreuma, *D.*] Mix them; then, with a slow fire, let a gallon distil). This preparation has no advantage over, while it is much weaker than, the more simple and elegant preparation, the *essence of spearmint* of the shops; which is prepared by dissolving fʒj. of the oil of spearmint in f℥j. of rectified spirit: the dose is from ten to twenty drops. The dose of spirit of spearmint is from fʒss. to fʒij.

5. *Aqua Menthæ viridis*, L. E. D.—(Spearmint leaves, if dried, lb. ij.; if fresh, lb. iv. [or Oil of Spearmint, ʒij. *L.*]; Proof Spirit, ℥vij. [Rectified Spirit, f℥iij. *E.*]; Water, *Cong.* ij. Mix. Let a gallon distil. The *Dublin College* employs no spirit; and distils a gallon of water from lb. jss. of herb). Spearmint water is usually made extemporaneously by suspending or dissolving a drachm of the oil in four pints of distilled water, by means of a drachm of rectified spirit and a lump of sugar. Some persons employ, as a substitute for the spirit and sugar, a drachm of carbonate of magnesia, with which the oil is rubbed, and to these the water is added gradually. But the practice, though authorized by the London College, is objectionable when the medicated water is used as a solvent for bichloride of mercury, on account of a minute portion of magnesia held in solution. Spearmint water is carminative and stomachic. It is commonly used as a vehicle for other medicines. Its dose is f℥j. to f℥iij.

Men'tha piperi'ta, Linn., L. E. D.—*Peppermint.*

Sex. Syst. Didynamia, Gymnospermia.

(Herba, *D.*—Herb: Volatile oil, *E.*)

History.—This plant was probably introduced into medicine in the last century; at least Hill (*Hist. of the Mat. Med.* p. 358), in 1751, says that it "has lately got into great esteem;" and Geiger (*Handb. d. Pharm.* Bd. iii. S. 1230) says, it was introduced into Germany as a medicine, through the recommendations of the English, in the latter half of the last century.

Botany. *Gen. Char.*—See *Mentha viridis.*

Sp. Char.—*Stem* smooth. *Leaves* petiolated, ovate-oblong, acute, serrate, rounded-crenate at the base, smooth. *Spikes* lax, obtuse, short, interrupted at the base. *Pedicels* and *calyx* at the base smooth; teeth hispid (Bentham).—Creeping-rooted.

Hab.—Watery places. Indigenous. Extensively cultivated at Mitcham, in Surrey, from whence the London market is principally supplied. Found in various parts of Europe; also in Asia, Africa, and America.

Properties.—The whole herb (*herba menthæ piperitæ*) is officinal. It has a peculiar aromatic odour, and a warm, burning, bitter taste, followed by a sensation of coolness when air is drawn into the mouth. Sesquichloride of iron communicates a green colour (*tannate of iron*) to the cold infusion of peppermint.

Composition.—The principal constituents are *volatile oil*, *resin ?*, *a bitter principle*, *tannic acid*, and *woody fibre*.

Oil of Peppermint (*Oleum Menthæ piperitæ*) is colourless, or nearly so, sometimes having a pale yellow or greenish tint, and becoming reddish by age. It has a penetrating odour like that of the plant, and a burning aromatic taste, followed by a sensation of cold. The vapour of it applied to the eye causes a feeling of coldness. *English Oil of Peppermint* is superior to that prepared on the continent. Its sp. gr. is 0·899. It boils at 365° F.; and consists, according to Mr. Kane, of $C^{25} H^{22} O^2$, or $2\frac{1}{2}$ ($C^{10} H^8$) + 2 (H O). In a warm, dry, and favourable season, the produce of oil, from a given quantity of the fresh herb, is double that which it yields in a wet and cold season. The largest produce is three drachms and a half of oil from two pounds of fresh peppermint, and the smallest about a drachm and a half from the same quantity (Brande, *Dict. of Mat. Med.* p. 356.) I was informed by a distiller at Mitcham, that twenty mats of the herb (each mat containing about 1 cwt.) yields about seven lbs. of oil.

Physiological Effects.—Peppermint is an aromatic or carminative, stimulant, and stomachic. It is the most agreeable and powerful of all the mints.

Uses.—It is employed in medicine for several purposes, but principally to expel flatus, to cover the unpleasant taste of other medicines, to relieve nausea, griping pain, and the flatulent colic of children. The following are the officinal preparations, with their uses :—

1. *Oleum Menthæ piperitæ*, L. E. D.—(Obtained by submitting the fresh herb to distillation with water. Its physical and chemical properties have been already noticed. It is carminative and stimulant, and is used occasionally as an antispasmodic. It is taken on sugar, in doses of from gtt. ii. to gtt. v.

2. *Spiritus Menthæ piperitæ*, L. D.; *Spiritus Menthæ*, E.—(Prepared with the Oil of Peppermint, in the same way as the *Spiritus Menthæ viridis*, L. D. before described. The *Edinburgh College* prepares it thus:—Peppermint, fresh, lb. iss.; Proof Spirit, Ovij. Macerate for two days in a covered vessel; add a pint and a half of water; and distil off seven pints). A solution of the oil of peppermint in spirit may with great propriety be substituted for the preparation of the Pharmacopœias. *Essence of peppermint* is prepared by dissolving f℈i. of the volatile oil in f℥i. of rectified spirit. Some persons add peppermint or spinach leaves to communicate a green colour. The dose of this essence is from gtt. xx. to gtt. xxx. on sugar. The spirit of peppermint is given in doses of from fʒss. to fʒii.

3. *Aqua Menthæ piperitæ*, L. E. D.—(Prepared with the herb or the oil of peppermint in the same way as the *Aqua Menthæ viridis*). Carminative and stimulant. Used to relieve flatulency, and as a vehicle for other medicines. Dose, f℥i. to f℥iij.

Besides the above, there are several popular preparations of peppermint extensively used. *Infusum Menthæ piperitæ* (*Peppermint Tea*) is prepared in the same way as spearmint tea.—*Elæosaccharum Menthæ piperitæ*, Ph. Bor., is prepared by mixing ʒi. of the whitest sugar, in powder, with gtt. xxiv. of the oil of peppermint.—*Rotulæ Menthæ piperitæ* (in plano-convex masses, called *peppermint drops*,—in flattened, circular disks, termed *peppermint lozenges*) should consist of sugar and oil of peppermint only, though flour is sometimes introduced.—The *liqueur* sold at the spirit-shops as *peppermint* is used as a cordial.

Men'tha Pule'gium, Linn. L. E. D.—*Pen'nyroyal.*

Sex. Syst. Didynamia, Gymnospermia.

(Herba, *D.*—Herb, *E.*)

History.—This plant was employed in medicine by the ancient Greeks and Romans. It is the Γλήχων of Hippocrates (p. 359, &c. ed. Fæs.) and Dioscorides (lib. iii. cap. xxxvi.), and the *Pulegium* of Pliny (*Hist. Nat.* lib. xx. cap. 54, ed. Valp.)

Botany. *Gen. Char.*—See *Mentha viridis.*

Sp. Char.—*Stem* very much branched, prostrate. *Leaves* petiolated, ovate. *Whorls* all remote, globose, many-flowered. *Calyxes* hispid, bilabiate, villous in the inside of the throat (Bentham).—Creeping-rooted.

Hab.—Wet commons and margins of brooks. Indigenous. A native of most parts of Europe, of the Caucasus, Chili, and Teneriffe.

Properties.—The herb with the flowers (*herba* seu *summitas pulegii*) is employed in medicine. It has a strong but peculiar odour; a hot, aromatic, bitter taste, followed by a feeling of coolness in the mouth. Sesquichloride of iron causes a green colour (*tannate of iron*) with the cold infusion of pennyroyal.

Composition.—Its principal constituents are *volatile oil*, *a bitter matter*, *resin?*, *tannic acid*, and *woody fibre.*

Oil of Pennyroyal (*Oleum Menthæ Pulegii*) has a pale colour, a warm taste, and the peculiar odour of the herb. It boils, like oil of turpentine, at 314° F.; and is composed, according to Mr. Kane, of $C^{10} H^8$, so that its composition is similar to the oils of turpentine, juniper, savin, lemon, &c. The fresh herb yields from 1-120th to 1-100th of its weight of oil (Brande, *Dict. Mat. Med.* p. 357).

Physiological Effects.—Its effects are analogous to the other mints. Emmenagogue and antispasmodic properties are ascribed to it by the public, and formerly by medical practitioners.

Uses.—A popular remedy for obstructed menstruation, hysterical complaints, and hooping-cough. Rarely employed by the professional man. The following are its officinal preparations, with their uses:—

1. *Oleum Menthæ Pulegii*, L. E. D.; *Oleum Pulegii*, offic.—(Obtained by submitting the herb to distillation with water). Its physical and chemical properties have been already described. It is stimulant and carminative; and is used, as an antispasmodic and emmenagogue, in doses of from gtt. ii. to gtt. v. taken on sugar.

2. *Spiritus Menthæ Pulegii*, L.—(Prepared with Oil of Pennyroyal as the *Spiritus Menthæ viridis*). Usually prepared by dissolving the oil in spirit. Stimulant and carminative. Employed as an antispasmodic and carminative. Dose, f℈ss. to f℈ii. *Essence of Pennyroyal* (prepared by dissolving f℈i. of the volatile oil in f℥i. of rectified spirit) may be given in doses of from gtt. x. to gtt. xx.

3. *Aqua Menthæ Pulegii*, L. E. D.; *Aqua Pulegii*, offic.—(Prepared like *Aqua Menthæ viridis*). Carminative and stomachic. Dose, f℥i. to f℥iij. The liquid sold in the shops as *pennyroyal and hysteric water* is prepared by adding f℥ss. of the *compound spirit of bryony* to Oss. of pennyroyal water.

Rosmari'nus officina'lis, Linn. L. E. D.—*Common Rosemary.*

Sex. Syst. Diandria, Monogynia.

(Cacumina, *L. D.*—Tops, *E.*)

History.—The Λιβανωτὶς στεφανωματικὴ, or *Libanotis coronaria* of Dioscorides (lib. iii. cap. 89), is supposed to be our officinal rosemary, which received its name, Λιβανωτὶς (from Λίβανος, *Thus*) on account of its odour, and στεφανωματικὴ (στεφανωματικὸς, *coronarius*) from its use in making garlands. Pliny (*Hist. Nat.* lib. xix. cap. 62, ed. Valp.) calls it *Rosmarinum*. The flowers are termed *anthos* (from ἄνθος, *a flower*), signifying they are *the flowers* par excellence; just as we call cinchona *the bark*, and the inspissated juice of the poppy, *opium* (i. e. *the juice*).

Botany. *Gen. Char.*—*Calyx* ovate-campanulate, two-lipped; the upper lip entire, the lower bifid, the throat naked within. *Corolla* with a protuding tube, smooth and not ringed in the inside, somewhat inflated in the throat; limb bilabiate; lips nearly equal, the upper one erect and emarginate, the lower spreading, trifid, with the lateral lobes erect, somewhat twisted; the middle lobe very large, concave, and hanging down. No rudiments of the superior *stamina*: fertile (inferior) ones, two, ascending, protruding: *filaments* inserted in the throat of the corolla, shortly-toothed near the base: *anthers* linear, subbilocular; the cells straggling, confluent, connate at the margin. Upper lobe of the *style* very short. *Stigmas* minute, terminal. *Achenia* dry, smooth (Bentham).

Sp. Char.—The only species.—*Leaves* sessile, linear, revolute at the edge, hoary beneath. *Calyx* purplish. *Corolla* white or pale purplish-blue.

Hab.—South of Europe; also Asia Minor.

Properties.—The flowering tops (*cacumina rosmarini*) are the officinal parts. They have a strong and remarkable odour, and a warm, bitter taste.

Composition.—The peculiar odour and flavour of this plant depend on *volatile oil.* Besides this, the tops contain *tannic acid, a bitter matter, resin?* and *woody fibre.*

Oil of Rosemary (*Oleum Rosmarini* seu *Oleum Anthos*) is transparent and colourless, with the odour of rosemary, and a hot, aromatic taste. Its sp. gr. is 0·85; and it boils at 332° F. It consists, according to Mr. Kane, of $C^{45} H^{38} O^2$, or $4\frac{1}{2}$ $(C^{10} H^8) + H^2 O^2$. One pound of the fresh herb yields about one drachm of the oil (Brande, *Dict. of Mat. Med.* p. 466).

Physiological Effects.—Carminative and mildly stimulant, analogous to the other labiate plants.

Uses.—Rarely employed medicinally. *Infusion of rosemary* (*rose mary tea*) is sometimes used as a substitute for ordinary tea by hypochondriacal persons. The admired flavour of Narbonne honey depends on the bees collecting this substance from rosemary plants which abound in the neighbourhood of Narbonne: hence sprigs of rosemary are sometimes added to the honey of other places, in order to imitate the flavour of Narbonne honey.

1. Oleum Rosmarini, L. E. D.; *Oleum Anthos*, offic.—(Prepared by submitting the rosemary tops to distillation with water). This oil was first procured by Raymond Lully (Thomson's *Hist. of Chem.* vol. i. p. 41). Its physical and chemical properties have been already noticed. It is

rarely taken internally, but is not unfrequently used externally, in conjunction with other substances, as a stimulating liniment; for example, in alopecia or baldness, and also as a perfume. Dose, gtt. ii. to gtt. v.

2. *Spiritus Rosmarini*, L. E. D.—(Oil of Rosemary, ʒii.; Rectified Spirit, *Cong.* i.; Water, Oj. Mix them; then with a slow fire let a gallon distil, *L.* The *Edinburgh* and *Dublin Colleges* submit the tops [lb. iiss. *E.* lb. iss. *D.*] to distillation with a gallon of Spirit [Rectified, *E.*; Proof, *D.*], so as to obtain seven [five, *D.*] pints of the distilled spirit). It is usually prepared merely by dissolving the oil in spirit, distillation being superfluous. Seldom employed internally. Its principal use is as an odoriferous adjunct to lotions and liniments. It is a constituent of the *Linimentum Saponis* (p. 337), and *Tinctura Lavandulæ composita* (p. 826).

Aqua Hungarica (*Aqua Rosmarini* seu *Anthos composita*). Various formulæ for the preparation of this perfume have been given. The following is from the *Pharm. Wurtem.* and *Bavar.*:—Take of fresh Rosemary, in blossom, lbs. iv.; fresh Sage, in blossom, ℥vi.; Zingiber, ℥ij. Cut into pieces, and add Rectified Spirit, lb. xij.; Common Water, Oij. Let eleven pints distil by a gentle heat. A hermit is said to have given the formula for the preparation of this perfume to a queen of Hungary; whence this water has been called the *Queen of Hungary's water* (*Aqua Reginæ Hungariæ*). Hungary water is frequently imitated by mixing Spirit of Lavender, f℥xij. with Spirit of Rosemary, f℥iv.—This liquid is employed principally as a perfume for the toilette; also as an excitant and restorative in fainting. Externally it is used as a stimulating liniment.

Orig'anum vulga're, L. E. D.—*Common Mar'joram.*

Sex. Syst. Didynamia, Gymnospermia.

(Herb, *E.*—Oleum ex herba, *D.*)

History.—Several kinds of Ὀρίγανος are mentioned by the Greek and Latin writers, but their descriptions are too vague to enable us to determine with precision the particular plants referred to.

Botany. *Gen. Char.*—*Calyx* ovate, tubular, ten to thirteen-nerved, striated, with five equal or three superior scarcely longer teeth: throat villous within. Tube of the *corolla* almost the length of the calyx, or scarcely longer; limb sub-bilabiate; upper limb nearly erect, emarginate; the lower spreading, trifid, with nearly equal lobes. *Stamina* four, protruding, distant, somewhat didynamous, the lower ones longer. *Style* cleft at the point into two nearly equal parts. *Achenia* dry, somewhat smooth (Bentham).

Sp. Char.—Erect, villous. *Leaves* petiolate, broad-ovate, obtuse, subserrate, rounded at the base, green on both sides. *Spikes* oblong or cylindrical, clustered in corymbose panicles. *Bracts* ovate, obtuse, coloured, half as long again as the calyx (Bentham).—Creeping-rooted. *Flowers* light purple.

Hab.—In bushy places, on a limestone and gravelly soil. Indigenous. A native of several parts of Europe; also of Asia. Flowers in July and August.

Properties.—The whole herb (*herba origani*) is officinal. It has a peculiar aromatic odour, and a warm, pungent taste. Sesquichloride of iron produces a green colour (*tannate of iron*) with the cold infusion of origanum.

Composition.—*Volatile oil, resin?, tannic acid, a bitter principle,* and *woody fibre,* are the principal constituents of this plant.

Oil of Common Marjoram; Oil of Thyme, offic. (*Oleum Origani*); has a red colour, an acrid taste, and the peculiar odour of the plant. It boils at 324°, and is composed, according to Mr. Kane, of $C^{50} H^{40} O$, or $5 (C^{10} H^{8}) + O$. The average produce of essential oil from the herb is one pound from two hundred weight; but it varies exceedingly with the season and culture of the plant (Brande, *Dict. Mat. Med.* p. 401).

Physiological Effects.—Stimulant and carminative, like the other labiate plants.

Uses.—Principally employed to yield the volatile oil. The dried leaves have been used as a substitute for China tea (Murray, *App. Med.* vol. ii. p. 173). The infusion of origanum has been administered in chronic cough, asthma, and amenorrhœa.

Oleum Origani, L. E. D. — (Obtained by submitting the herb to distillation with water). It is a powerful acrid and stimulant; and is applied to carious teeth by means of lint or cotton, to relieve toothache. Mixed with olive oil, it is frequently employed as a stimulating liniment against alopecia or baldness, rheumatic or paralytic affections, sprains, bruises, &c.

Majora'na horten'sis, Mœnch.—*Sweet Mar'joram.*

Origanum Majorana, *Linn. D.*

Sex. Syst. Didynamia, Gymnospermia.

(Herba, *D.*)

History.—Some botanists regard the ἀμάρακος of Hippocrates (p. 585 & 645, ed. Fæs.), the σαμψύχον of Dioscorides (lib. iii. cap. 47), the *Amaracum* or *Sampsuchum* of Pliny (*Hist. Nat.* lib. xxi. cap. 35. ed. Valp.) as being the *Majorana hortensis* (Dierbach, *Arzneimittell. d. Hippokrat.* p. 179).

Botany. *Gen. Char.*—*Calyx* very shortly campanulate at the base; the limb cleft superiorly, flattened and dilated, quite entire, orbicular; the margin rolled in beneath the base; fauces naked. Tube of the *corolla* as long as the calyx; limb sub-bilabiate, the upper lip nearly erect, emarginate, the lower one spreading, trifid, with almost equal lobes. *Stamens* four, protruding, distant, didynamous, the inferior ones longest. *Anthers* two-celled; the cells parallel, diverging or becoming straggling. *Style* cleft into two nearly equal parts. *Stigmas* minute (Bentham).

Sp. Char.—*Branches* smoothish, racemose-paniculate. *Leaves* petiolate, oblong-ovate, obtuse, quite entire, on both sides hoary-tomentose. *Spikelets* oblong, on sessile, crowded branchlets (Bentham).—*Flowers* purple or white.

Hab.—Africa and Asia. Cultivated in kitchen-gardens.

Properties.—The whole plant (*herba majoranæ*) has a warm aromatic flavour, and a peculiar savoury smell. Its watery infusion is deepened in colour (*tannate of iron*) by sesquichloride of iron.

Composition.—By distillation the plant yields *volatile oil.* The other constituents are *tannic acid*, *resin?*, *bitter matter*, and *woody fibre.*

Oil of Sweet Marjoram (*Oleum Majoranæ*) is pale yellow or brownish, with the strong odour and taste of marjoram.

Physiological Effects.—Tonic and mild stimulant.

Uses.—Principally employed as a sweet herb by the cook. Its powder is sometimes used, either alone or mixed with some other powder, as an errhine. *Marjoram tea* is occasionally employed as a popular remedy for nervous complaints.

Melis'sa officina'lis, Linn. E. D.—*Common Balm.*

Sex. Syst. Didynamia, Gymnospermia.

(Herba, *D.*—Herb, *E.*)

History.—Sprengel (*Hist. Rei Herb.* t. i. p. 100) considers this plant to be the *μελισσόφυλλον* or *μελίτταινα* of Dioscorides (lib. iii. cap. 118).

Botany. *Gen. Char.*—*Calyx* tubular, 13-nerved, generally striated, bilabiate: upper lip spreading, three-toothed: lower bifid; fauces naked or villous. Tube of *corolla* straight or bent, naked within, generally protruding; fauces inflated; limb bilabiate; the upper lip erect, flat; the lower spreading. *Stamina* four, didynamous, generally approximated in pairs; upper ones sometimes sterile: *filaments* toothless: *anthers* free, two-celled: *connective* often thickened. *Achenia* dry, smooth (Condensed from Bentham).

Sp. Char.—Herbaceous, erect, branching. *Leaves* broad-ovate, crenate, truncate or cordate at the base. *Whorls* axillary, loose, one-sided. *Bracts* few, ovate. *Corolla* longer by half than the calyx (Bentham).

Hab.—South of France.

Properties.—The fresh herb (*herba melissæ*) has a strong, peculiar odour, which is somewhat similar to that of lemons. By drying, this is, for the most part, lost. The taste is aromatic, bitter, and somewhat austere. Sesquichloride of iron gives a greenish colour (*tannate of iron*) to the cold infusion.

Composition.—The principal constituents of balm are *volatile oil, resin, bitter matter, gum, tannic acid*, and *woody fibre* (Pfaff, *Mat. Med.* Bd. iv. S. 270).

Oil of Balm (*Oleum Melissæ*) is pale yellow, and has the peculiar odour of balm. Its sp. gr. is 0·975. Oil of lemon is said to be frequently substituted for it.

Physiological Effects.—The effects of balm are similar to, though milder than, those of the labiate plants already described. The mildness of its operation arises from the small portion of volatile oil which the plant contains.

Uses.—*Balm tea* is sometimes employed as a diaphoretic in fevers, as an exhilarating drink in hypochondriasis, and as an emmenagogue in amenorrhœa and chlorosis.

Marru'bium vulga're, Linn. L. D.—*White Horehound.*

Sex. Syst. Didynamia, Gymnospermia.

(Herba.)

History.—This is the plant which is called *Πράσιον* by Hippocrates (pp. 686, 874, & 878, ed. Fæs.), Theophrastus, and Dioscorides (lib. iii. cap. 119); and *Marrubium* by Pliny (*Hist. Nat.* lib. xx. cap. 89, ed. Valp.)

Botany. *Gen. Char.*—*Calyx* tubular, five- to ten-nerved, equal, with five to ten acute, spiny teeth. *Corolla* with the upper lip erect, the lower spreading and trifid, with the middle lobe broader and generally emarginate. *Stamens* didynamous, inclosed; *anthers* with divaricating, somewhat confluent lobes, all nearly of the same form. *Style* with short obtuse lobes (Condensed from Bentham).

Sp. Char.—*Branches* white-woolly. *Leaves* ovate or rounded, softly villous, greenish- or white-woolly beneath, crenate. *Whorls* many-flowered. *Calyx* villose, woolly, with ten subulate, recurved-spreading teeth. *Corolla* with an oblong helmet, bifid at the point (Bentham). *Flowers* white.

Hab.—Dry waste grounds. Indigenous. Grows in most parts of Europe; also in Asia and America.—Flowers in July.

Properties.—The whole herb (*herba marrubii*) is used in medicine. It has an aromatic odour, and a bitter taste. Sesquichloride of iron communicates an olive green tint (*tannate of iron*) to the cold watery infusion.

Composition.—Its bitterness depends on *extractive;* its aromatic properties on *volatile oil.* Besides these principles it contains *resin, tannic acid, bitter matter*, and *woody fibre.*

Physiological Effects.—Horehound is tonic, mildly stimulant, and, in large doses, laxative. Taken in the form of infusion, it promotes the secretions of the skin and kidneys. It was formerly supposed to possess emmenagogue properties.

Uses.—It is rarely employed by medical practitioners. As a domestic remedy it is used in chronic pulmonary complaints, especially catarrh. It was formerly given in uterine and hepatic affections.

Administration.—*Horehound tea* (prepared by infusing an ounce of the herb in a pint of boiling water) is taken in the dose of a wine-glassful. *Syrup of horehound* (prepared with the infusion and sugar) is a popular remedy, and is kept in the shops. *Candied horehound* ought to be made of the same ingredients.

Other Medicinal and Dietetical Labiatæ.

The following species, enumerated by Loudon (*Encyclop. of Gardening*, p. 871), are cultivated in this country as *sweet herbs:*—Common or Garden Thyme (*Thy'mus vulga'ris*, Linn.), Lemon Thyme (*T. citriodo'rus*, Schreb.), Sage (*Sal'via officina'lis*, Linn.), Clary (*S. Scla'rea*, Linn.), Peppermint (*Men'tha piperi'ta*, Linn.), Spearmint, (*M. vir'idis*, Linn.), Pennyroyal (*M. Pule'gium*), Common Marjoram (*Orig'anum vulga're*, Linn.), Winter Sweet Marjoram (*O. her'acleo'ticum*, Linn.), Sweet Marjoram (*Majora'na horten'sis*, Mœnch.), Pot Marjoram (*M. Oni'tes*, Benth.), Winter Savory (*Saturej'a monta'na*, Linn.), Summer Savory (*S. horten'sis*, Linn.), Sweet or Larger Basil (*O'cimum Basil'icum*, Linn.), Bush or Least Basil (*O. min'imum*, Linn.), Rosemary (*Rosmari'nus officina'lis*, Linn.), and Garden Lavender (*Lavan'dula ve'ra*, Decand.) Several of these species have been, or are, used in medicine, and several of them are officinal. The general effects and uses of the *sweet* or *savoury herbs* have been before pointed out (p. 72).

Besides the labiate plants above described, and which are the only officinal ones in the British pharmacopœias, a considerable number of other species have been at different times introduced into medicinal use. Some of these are deficient in volatile oil, but abound in a bitter principle, on which account they have been employed as stomachics and tonics: such are Water Germander (*Teu'crium Scor'dium*, Linn.), Wall Germander (*T. Chamæ'drys*, Linn.), and Ground Pine (*Aju'ga Chamæ'pitys*, Smith); the two last of which have been used, as I have before mentioned, as anti-arthritic remedies (p. 781). Others abound in essential oil, and are consequently more aromatic, stimulant, and carminative: such are Cat-Thyme (*Teu'crium Ma'rum*, Linn.), Common Hyssop (*Hysso'pus officina'lis*, Linn.), Dittany of Crete (*Amara'cus Dictam'nus*, Benth.), &c.

Order 34. Scrophularia'ceæ, *Lindley*.—The Figwort Tribe.

Personatæ, *Decand.*—Scrophularineæ, *R. Brown.*

Essential Character.—*Calyx* free, five-divided, or more generally (by abortion) four-divided; the *sepals* more or less united, or sometimes free, unequal; the upper one largest; the lateral ones smallest; imbricated in æstivation. *Corolla* monopetalous, five-divided or (by the cohesion of the two upper petals to the apex) four-divided; the tube short, or elongated; the limb expanded or erect, nearly equally partite or bilabiate; imbricated in æstivation. *Stamens* simple, opposite the sepals; the upper stamens entirely wanting, or sterile, very rarely fertile; shorter than the others; the two lateral equal, rarely abortive; the two lower equal to, or longer than the lateral ones; sometimes wanting. *Anthers* two- or one-celled, dehiscing longitudinally. *Ovary* free, two-celled; the cells two- or many-seeded. *Style* simple, rarely slightly bifid. *Fruit* capsular, rarely baccate, two-celled, two-seeded, dehiscing by valves or pores. *Dissepiment* parallel, or opposite to the valves, becoming loose in the centre, or altogether free. *Placenta* adhering to the dissepiments; sometimes separating when ripe. *Seeds* generally indefinite. *Embryo* variously placed in the albumen. —Inodorous or fetid *herbs* or *shrubs* (Macreight.)

Properties.—Not uniform: suspicious.

Digita'lis purpu'rea, Linn. L. E. D.—*Purple Foxglove.*

Sex. Syst. Didynamia, Angiospermia.

(Folia; Semina, *L.*—Folia, *D.*—Leaves, *E.*)

History.—It appears very improbable that the ancients should have overlooked so common and elegant a plant as foxglove; yet in none of their writings can we find any plant whose description precisely answers to the one now under examination. Fabricius Columna (quoted by Mentzelius, *Index Nom. Plant.* p. 104) thought that it was the Ἐφήμερον of Dioscorides (lib. iv. cap. 85), but the description of the latter does not at all agree with foxglove. The Βάκχαρις (lib. iii. cap. 51) of the same writer has also been referred to, but with little more probability of correctness. The term Foxeꞅ-ᵹloꝼe occurs in a MS., *Glossarium Ælfrici*, probably written before the Norman Conquest (A. D. 1066), and in a MS. Saxon translation of L. Apulius; both of which are among the Cottonian manuscripts in the British Museum (Lye, *Dict. Saxon.*) Fuchsius (*Hist. Stirp.* 1542) is usually regarded as the earliest botanist who mentions this plant, which he named Digitalis (from *Fingerhut*, a finger-stall, on account of the blossoms resembling the finger of a glove). Fuchsius states, that until he gave it this appellation, the plant had no Greek or Latin name.

Botany. *Gen. Char.*—*Calyx* five-partite, unequal. *Corolla* campanulate; the limb obliquely four-lobed; the lobes unequal. *Stamens* four, didynamous; no vestige of the fifth apparent. *Stigma* simple or bilamellate. *Capsule* ovate-acuminate (*Bot. Gall.*)

Sp. Char.—*Segments of the calyx* ovate, acute. *Corolla* obtuse; its upper lobe scarcely cloven. *Leaves* downy (Smith).—Herbaceous. *Root* of numerous long and slender fibres; biennial. *Stem* erect, three or four feet high, commonly simple, roundish with several slight angles, downy. *Leaves* alternate, ovate-lanceolate or elliptic-oblong, crenate, downy, rugged, and veiny, of a dull green; tapering at the base into winged footstalks; lower ones largest. *Raceme* terminal, erect, one-sided, long, simple, of numerous, large, pendulous, odourless flowers. *Corolla* crimson, elegantly marked with eye-like spots, as well as hairy, within.—A variety with white flowers, spotted with shades of cream-colour or pearl, is met with in gardens: it remains tolerably constant from seed.

Hab.—Indigenous: in pastures and about hedges or banks, on a gravelly or sandy soil.

Description.—The officinal parts are the leaves and seeds; the latter, however, are rarely employed. As some doubts have been expressed as to the equal activity of cultivated specimens, wild or native plants are to be preferred.

1. *Foxglove leaves* (*Folia Digitalis*).—The leaves should be gathered when the plant is in the greatest perfection,—that is, just before or during the period of inflorescence; and those are to be preferred which are full-grown and fresh. As the petioles possess less activity than the laminæ or expanded portions of the leaves, they ought to be rejected. Dr. Withering (*Account of the Foxglove*, p. 181, 1785) directs the leaves to be dried either in the sunshine, or in a tin pan or pewter dish before the fire; but the more usual, and, I believe, better mode of proceeding, is to dry them in baskets in a dark place, in a drying stove. Both dried leaves and powder should be preserved in well-stoppered bottles, covered externally by dark-coloured paper, and kept in a dark cupboard. As both undergo changes by keeping, whereby their medicinal activity is considerably diminished, they ought to be renewed annually. Dried foxglove leaves have a dull green colour, a faint odour, and a bitter nauseous taste.

2. *Foxglove seeds* (*Semina Digitalis*).—The seeds of the foxglove are small, roundish, and of a grayish-brown colour.

Composition.—The chemistry of digitalis is in an unsatisfactory state. This arises from the inconclusive and discordant results obtained by those who have submitted this plant to chemical examination. Analyses of it have been published by Destouches (*Bull. de Pharm.* t. i. p. 123), Bidault de Villiers (*Essai sur les Propr. méd. de la Digit. pourp.* 3e édit. 1812), Rein and Haase (*Diss. de Digit. purp.* 1812, quoted in Schwartze's *Pharm. Tabell.*), Le Royer (*Bibl. Univers. des Sciences*, t. xxvii. p. 102, 1824, Genève), Welding (*Journ. of the Philadelph. Coll. of Pharm.* July 1833), Radig (*Pharm. Central-Blatt für* 1835, S. 209), and Brault and Poggiale (*Journ. de Pharm.* t. xxi. p. 130, 1835).

Radig's Analysis.

Picrin (Digitalin of Le Royer)	0·4
Digitalin (of Lancelot)	8·2
Scaptin (acrid extractive)	14·7
Chlorophylle	6·0
Oxide of iron	3·7
Potash	3·2
Acetic acid	11·0
Vegetable albumen	9·3
Woody fibre	43·6
Foxglove leaves	100·1

Brault and Poggiale's Analysis.

Resin.
Fatty matter.
Chlorophylle.
Starch.
Gum.
Lignin.
Tannin.
Salts of lime and potash.
Volatile oil.
Fixed oil.
Oxalate of potash.

Foxglove leaves.

1. *Digitalina* of Lancelot (*Pharm. Central-Blatt für* 1833, p. 620) and of Radig (*op. supracit.*) This substance has been obtained by Radig in small crystals, whose forms were not accurately determined. It is colourless, has an acrid taste, is unchanged in the air, renders syrup of violets green, and restores the blue colour of reddened litmus.

It is soluble in alcohol and in acids: the solutions were very bitter, and were decomposed by water, by diacetate of lead, and by infusion of nutgalls. Concentrated sulphuric acid first reddens digitalina, and then makes it olive-green. By distillation it does not evolve ammonia. Dr. David found that, when from ½ to 1½ grains were injected into the veins of an animal, death speedily ensues without convulsions, and with the same effect upon the pulse which characterizes digitalis.

2. *Picrin.* (from *πικρὸς, bitter*).—The substance which Radig calls picrin, and which he says is identical with the digitalin of Le Royer, is bitter, hygrometric, soluble in water, alcohol, and ether, and precipitable from its watery solution by bichloride of mercury, ferro-cyanide of iron, and acetate of lead. Brault and Poggiale, however, declare the digitalin of Le Royer to be a compound of chlorophylle, resin, a fatty matter, and some traces of salts of lime and potash; and they ascribe the activity of foxglove to the combination of all the principles of which this plant is composed, but especially to the resin.

3. *Scaptin.*—Radig has applied the term scaptin to a brown, almost tasteless extractive, which leaves an acrid sensation in the throat.

4. *Empyreumatic Oil of Foxglove* (*Pyrodigitalina*).—By the destructive distillation of the dried leaves of foxglove, Dr. Morries (*Ed. Med. and Surg. Journ.* vol. xxxix. p. 377) obtained a coloured, disagreeable, empyreumatic oil, which was semi-solid at 60° F. and soluble in boiling alcohol and ether: the solutions, on cooling, let fall a flocculent precipitate composed of two substances, one crystalline, the other globular. Given to a rabbit, it caused paralysis of the hind legs, convulsions, laborious and rapid breathing, and accelerated action of the heart. It does not contain the sedative principle of foxglove.

Chemical Characteristics.—Sesquichloride of iron causes a dark precipitate (*tanno-gallate of iron*) with decoction of foxglove leaves, as well as with the tincture diluted with water. A solution of gelatin, added to the decoction, causes, after some time, a scanty precipitate (*tannate of gelatin*). Tincture of nutgalls has scarcely any effect (perhaps a slight turbidness) when added to the decoction or to the tincture diluted with water.

Physiological Effects. (*a.*) *On vegetables.*—Marcet (*Ann. de Chim. et de Phys.* vol. xxix. p. 200) found that a solution of the watery extract of foxglove killed a haricot plant (*Phaseolus vulgaris*) in twenty-four hours.

(*b.*) *On animals generally.*—The effects of foxglove have been tried on dogs (Orfila, *Toxicol. Gén.*), horses, rabbits (Le Royer, *Bibl. Univ.* June 1824), turkeys (Salerne, *Hist. de l'Acad. des Scien.* 1748, p. 84), the domestic fowl, and frogs; and on all it has been found to act as a poison. One drachm of the powder may be given to horses as a sedative in inflammation (Youatt, *The Horse*, in *Libr. of Usef. Knowl.*) Two ounces have produced death in twelve hours (Moiroud, *Pharm. Vétér.* p. 354). According to the experience of Orfila, the first symptoms of poisoning observed in [carnivorous] animals is vomiting. The influence of the poison over the heart does not appear to be uniform; for in some cases he found the pulsations of this viscus unaltered, in others accelerated, while occasionally they were retarded. In the horse killed by two ounces of foxglove, the pulse was 130 per minute, a short time before death (Moiroud): the standard pulse of the horse being 40 or 42 per minute. The cerebro-spinal symptoms observed in animals, are diminished muscular power, convulsive movements, tremors, and insensibility. The powder acts as a local irritant, giving rise to inflammation of parts to which it is applied (Orfila).

(*c.*) *On man.*—We may, for convenience, establish three degrees of the operation of foxglove.

In the first degree, or that produced by *small and repeated doses*, foxglove sometimes affects what are termed the organic functions, without disordering the animal or cerebro-spinal functions. Thus we sometimes have the stomach disordered, the pulse altered in frequency, and sometimes also in fulness and regularity, and the secretion of urine increased, without any other marked symptoms. The order in which the symptoms just mentioned occur is not uniform: sometimes the diuresis, at others nausea, and occasionally the affection of the circulation, being the first obvious effect.

The influence of foxglove over the circulation is not at all constant. In some cases the frequency of the pulse is augmented, in others decreased, while in some it is unaffected. Lastly, in a considerable number of instances, the pulse becomes irregular or intermittent under the use of foxglove. (See the statistical *resumé* of Sandras, *Bull. de Thérap.* t. vi.) A few drops of the tincture will, in some cases, reduce the frequency of the pulse, and render it irregular and intermittent, while in other instances much larger doses may be taken without any obvious effect on it. Dr. Withering (*Account of the Foxglove*, p. 73, 1785) mentions one case in which the pulse fell to 40, and I have several times seen it reduced to 50. In some cases the slowness of the pulse is preceded by an increased activity of the vascular system. From Sandras's (*op. cit.*) reports this would appear to occur more frequently after small than large doses of foxglove. Dr. Sanders (*Treat. on Pulm. Consumption*, ed. 1808) indeed asserts, that foxglove invariably excites the pulse, and refers to an experience of 2000 cases in proof. He says, that he has seen the pulse rise from 70 to 120 under the use of foxglove, and at the end of twenty-four hours, or sooner, fall with greater or less rapidity to forty, or even below this. But an experience of the use of foxglove in only twenty cases, will, I believe, convince most persons that Dr. Sanders has fallen into an error in the sweeping assertion which he has made. A great deal, however, depends on the position of the patient. If it be desired to reduce the frequency of the pulse, the patient should be kept in the recumbent posture. The important influence of posture was first pointed out, I believe, by Dr. Baildon (*Ed. Med. and Surg. Journ.* vol. iii. p. 270). His own pulse, which had been reduced by this plant from 110 to 40 beats per minute while he was in the recumbent position, rose to 70 when he sat up, and to 100 when he stood. We have a ready explanation of this fact. In a state of health the pulsations of the heart are more frequent (usually to the extent of five or six in the minute) in the erect than in the horizontal position; and it is very obvious that greater force is required to carry on the circulation in the former than in the latter, since, in the erect position, the heart and arteries have to send blood to the head against gravity. Now, the power of the heart being enfeebled by foxglove, when a demand is made on this viscus for an increase in the force of contractions by the change from the recumbent to the standing attitude, it endeavours to make up for its diminished force by an increase in the frequency of its contractions. I need scarcely add that the sudden change of position in those who are much under the influence of this medicine, is attended with great danger, and in several instances has proved fatal; for, in consequence of the heart not having sufficient power to propel the blood to the head against gravity, fatal syncope has been the result. (For some interesting remarks on the *Effects produced by posture on the pulse*, by Dr. Graves, consult *Dubl. Hosp. Rep.* vol. x. p. 561.) The influence of digitalis over the pulse is more marked in some individuals or cases than in others; thus the reduction of the frequency of the pulse is in general more readily induced in weak and debilitated constitutions than in robust and plethoric ones. Occasionally no obvious effect on the number, force, or regularity of the pulse is produced, though the foxglove may be given to an extent sufficient to excite vomiting and cerebral disorder. Shroek (quoted by Wibmer, *Wirk. d. Arzneim. u. Gift.* Bd. ii. S. 311) experienced, from two grains of foxglove, nausea, headache, small, soft, and quick pulse, dryness of the gums and throat, giddiness, weakness of limbs, and increased secretion of saliva. Some hours after he observed sparks before the eyes, his vision became dim, and he experienced a sensation of pressure on the eye-balls.

A most important fact connected with the repeated uses of small doses of it, is the *cumulative effect* sometimes observed. It has not unfrequently happened that, in consequence of the continued use of small doses of this medicine, very dangerous symptoms, in some cases terminating in death, have occurred. The most prominent of these were great depression of the vascular system, giddiness, want of sleep, convulsions, and sometimes nausea and vomiting. (See the cases published by Dr. Withering, *op. cit.* Also a fatal case recorded by Dr. Blackall, *On Dropsy*, p. 175, 4th ed.) A knowledge of its occasional occurrence impresses us with the necessity of exercising great caution in the use of this remedy, particularly with respect to the continuance of its administration and increase of dose; and it shews that after the constitutional effect has become obvious, it is prudent to suspend from time to time the exhibition of the remedy in order to guard against the effects of this alarming accumulation. I may add, however, that I have used it, and seen others employ it, most extensively, and in full doses, and have rarely seen any dangerous consequences; and I believe, therefore, the effects of accumulation to be much less frequent than the statements of authors of repute would lead us to expect. The experience of Dr. Holland (*Med. Notes and Reflections*, p. 544) is to the same effect. "Though employing the medicine somewhat largely in practice," he observes, "I do not recollect a case in which I have seen any injurious consequences from this cause."

The diuretic operation for which we employ foxglove, is very inconstant. Dr. Withering stated, that this medicine more frequently succeeds as a diuretic than any other, and that if it fail, there is but little chance of any other remedy succeeding. My experience, however, is not in accordance with Dr. Withering's. I have frequently seen foxglove fail in exciting diuresis, and have often found the infusion of common broom (*Cytisus scoparius*) subsequently succeed. It has been asserted by some, that the diuretic effect of foxglove was only observed in dropsical cases, and that it, therefore, depended on the stimulus given to the absorbent vessels, and not to any direct influence exerted over the kidneys; but the statement is not true, since foxglove is sometimes found acting as a diuretic even in health. In some cases the bladder has appeared more irritable than usual, the patient having a frequent desire to pass his urine.

An increased flow of saliva is an occasional consequence of the continued use of moderate doses of foxglove. Dr. Withering (*op. cit.* p. 184) first noticed this effect. Dr. Barton (Beck's *Med. Jurisprudence*) has also seen it produced from ordinary doses.

2. The *second degree of operation* of digitalis, or that ordinarily resulting from the use of too large or too long-continued doses, is manifested

by the disordered condition of the alimentary canal, of the circulating organs, and of the cerebro-spinal system. The more ordinary symptoms are nausea or actual vomiting, slow and often irregular pulse, coldness of the extremities, syncope or a tendency to it, giddiness, and confusion of vision. Sometimes the sickness is attended with purging, or even with diuresis; at other times the patient is neither vomited nor purged; and the principal disorder of system is observed in the altered condition of the nervous and vascular organs. External objects appear of a green or yellow colour; the patient fancies there is a mist, or sparks, before his eyes; a sensation of weight, pain, or throbbing of the head, especially in the frontal region, is experienced; giddiness, weakness of the limbs, loss of sleep, occasionally stupor or delirium, and even convulsions, may also be present. The pulse becomes feeble, sometimes frequent, sometimes slow; there may be actual syncope, or only a tendency to it, and profuse cold sweats. Salivation is sometimes induced by poisonous doses of foxglove. It was observed in a case, narrated by Dr. Henry (*Ed. Med. and Surg. Journ.* vol. vii. p. 148), and has been known to last for three weeks (*Rust's Magazin*, xxv. 578).

The quantity of digitalis that may be given to a patient without destroying life, is much greater than is ordinarily imagined. In one instance I saw twenty drops of the tincture given to an infant labouring under hydrocephalus, three times daily for a fortnight, at the end of which time the little patient was completely recovered, without one untoward symptom. I have frequently given a drachm of the tincture (of the best quality) three times daily to an adult, for a fortnight, without observing any marked effect. I know that some practitioners employ it in much larger doses (as an ounce or half an ounce of the tincture), with much less effect than might be imagined. The following communication on this subject, from my friend Dr. Clutterbuck, illustrates this point:—"My first information on this subject was derived from an intelligent pupil, who had been an assistant to Mr. King, a highly respectable practitioner at Saxmundham, in Suffolk, who, on a subsequent occasion, personally confirmed the statement. This gentleman assured me, that he had been for many years in the habit of administering the tincture of digitalis, to the extent of from half an ounce to an ounce at a time, not only with safety, but with the most decided advantage, as a remedy for acute inflammation,—not, however, to the exclusion of blood-letting, which, on the contrary, he previously uses with considerable freedom. To adults he often gives an ounce of the tincture (seldom less than half an ounce), and awaits the result for twenty-four hours, when, if he does not find the pulse subdued, or rendered irregular by it, he repeats the dose; and this, he says, seldom fails to lower the pulse in the degree wished for; and when this is the case, the disease rarely fails to give way, provided it has not gone the length of producing disorganization of the part. He has given as much as two drachms to a child of nine months. Sometimes vomiting quickly follows these large doses of the digitalis, but never any dangerous symptom, as far as his observation has gone, which has been very extensive. In less acute cases he sometimes gives smaller doses, as thirty drops, several times in a day.

"Such is the account I received from Mr. King himself, and which was confirmed by his assistant, who prepared his medicines. I do not see any ground for questioning the faithfulness of the report. I have myself exhibited the tincture to the extent of half an ounce (never more), in not more than two or three instances (cases of fever and pneumonia). To my surprise there was no striking effect produced by it; but I did not venture to repeat the dose. In numerous instances I have given two drachms; still more frequently one drachm; but not oftener than once in twenty-four hours, and not beyond a second or third time. Two or three exhibitions of this kind I have generally observed to be followed by slowness and irregularity of pulse, when I have immediately desisted." Dr. T. Williams (*Lond. Med. Gaz.* vol. i. p. 744) states, that a man, in a state of intoxication, took two ounces of tincture of foxglove in two doses, in quick succession, without the slightest inconvenience.

3. The *third degree* of the operation of foxglove, or that resulting from the use of *fatal doses,* is characterized usually by vomiting, purging, and griping pain in the bowels; slow, feeble, and irregular pulse, great faintness, and cold sweats; disordered vision; at first giddiness, extreme debility; afterwards insensibility and convulsions, with dilated insensible pupils.

If we compare the effects of foxglove with those of other medicinal agents, we find they approximate more closely to those of tobacco than of any other cerebro-spinant. These two agents especially agree in their power of enfeebling the action of the heart and arteries (*see* pp. 67-68). Green tea agrees with foxglove in its property of preventing sleep. Considered as a diuretic, foxglove is, in some respects, comparable with squills. I have already (p. 654) pointed out the peculiarities attending the operation of each of these.

Uses.—We employ foxglove for various purposes, as,—1stly, to reduce the frequency and force of the heart's action; 2dly, to promote the action of the absorbents; 3dly, as a diuretic; and 4thly, sometimes on account of its specific influence over the cerebro-spinal system.

In the following remarks on the uses of foxglove in particular diseases, I refer to the administration of this remedy in the doses in which it is ordinarily employed. I have no experience of its therapeutical effects, when given in the enormous quantities mentioned by Dr. Clutterbuck.

1. *In fever.*—Digitalis is occasionally useful in fever to reduce the frequency of the pulse, when the excitement of the vascular system is out of proportion to the other symptoms of fever, such as the increased temperature, and the cerebral or gastric disorder. It cannot, however, be regarded, in the most remote way, as a curative means; on the other hand, it is sometimes hurtful. Thus, not unfrequently it fails to reduce the circulation; nay, occasionally, it has the reverse effect, accelerates the pulse, while it increases the cerebral disorder, and perhaps irritates the stomach. In estimating its value as a remedial agent for fever, we must not regard it as a sedative means (I refer now to the vascular system) merely; it is an agent which exercises a specific influence over the brain; and, therefore, to be able to lay down correct indications and contra-indications for its use in disordered conditions of this viscus, we ought to be acquainted, on the one hand, with the precise nature of the influence of the remedy, and, on the other, with the actual condition of the brain in the disease which we wish to ameliorate. Now as we possess neither of these data in reference to fever, our use of foxglove is, with the exception of the sedative influence over the circulation, empirical; and experience has fully shewn us it is not generally beneficial.

But, I repeat, where the frequency of pulse bears no relation to the local or constitutional symptoms of fever, foxglove may be serviceable.

2. *Inflammation.*—Foxglove has been employed in inflammatory diseases, principally on account of its power of reducing the frequency of the pulse, though some have referred part of its beneficial operation to its influence over the absorbent system. Inflammation, of a chronic kind, may be going on in one part of the body, to an extent sufficient to produce complete disorganization, and ultimately to cause the death of the patient, without the action of the larger arterial trunks (*i. e.* of the system generally) being remarkably increased. In such cases, digitalis is, for the most part, of little use. Again, in violent and acute inflammation, accompanied with great excitement of the general circulation, especially in plethoric subjects, foxglove is, in some cases, hurtful; in others, it is a trivial and unimportant remedy; and we therefore rely, in our treatment, on blood-letting, and other powerful antiphlogistic measures; and foxglove, if serviceable at all, can only be used after the other means.

As a remedy for inflammation, foxglove is principally useful in less violent cases, particularly when accompanied with increased frequency of pulse, and occurring in subjects not able to support copious evacuations of blood. Moreover, it has more influence over inflammation of some parts of the body (as the arachnoid membrane, the pleura, the pericardium, and the lungs) than of others. In gastric and enteritic inflammation, it would appear to be objectionable on account of its irritant properties; while its specific influence over the brain would make it a doubtful remedy in phrenitis. In arachnitis of children it is certainly a most valuable agent.

In conclusion, then, it appears that digitalis, as a remedy for inflammation, is principally valuable where the disease has a tendency to terminate in serous effusion. But in no case can it be regarded as a substitute for blood-letting. Its powers as an antiphlogistic remedy have, I suspect, been greatly over-rated.

3. *Dropsy.*—Of all remedies for dropsy none have gained more, and few so much, celebrity as foxglove. It has been supposed to owe its beneficial operation to its repressing arterial excitement (a frequent cause of dropsical effusion), to its promoting the functions of the absorbent vessels, and particularly to its diuretic effects. Whatever may be its *modus operandi*, its powerful and salutary influence in many dropsies cannot be a matter of doubt. Dr. Withering has correctly observed, that "it seldom succeeds in men of great natural strength, of tense fibre, of warm skin, of florid complexion, or in those with a tight and cordy pulse." "On the contrary, if the pulse be feeble or intermitting, the countenance pale, the lips livid, the skin cold, the swollen belly soft and fluctuating, or the anasarcous limbs readily pitting under the pressure of the finger, we may expect the diuretic effects to follow in a kindly manner." In those with a florid complexion, blood-letting and purgatives will often be found useful preparatives for foxglove. In some forms of dropsy, foxglove is more serviceable than in others. Thus, anasarca, ascites, hydrothorax, and phlegmasia dolens, are sometimes benefited by it; whereas ovarian dropsy and hydrocephalus are not relieved by it. Its diuretic effect is greatly promoted by combining other diuretics with it, especially squills (as in the *Pilulæ Digitalis et Scillæ*, Ph. Ed.), calomel, or the saline diuretics (as the acetate of potash). A combination

of vegetable bitters (as infusion of gentian or calumba) with foxglove, forms, I think, a valuable form of exhibition in many old dropsical cases. Infusion of common broom (*Cytisus scoparius*) might probably be advantageously conjoined with foxglove, where a powerful diuretic is required. In old cases of general dropsy, in œdematous swellings from debility, and in anasarca following scarlet fever, where, together with weakness, there is still left an excited and irritable state of the arterial system, chalybeates (as the *tinctura ferri chloridi*) may be conjoined with foxglove, with the happiest effects (Holland, *Med. Notes and Reflect.* p. 546).

4. *In Hemorrhages.*—In active hemorrhages from internal organs, accompanied with a quick, hard, and throbbing pulse, foxglove as a sedative is oftentimes serviceable. Epistaxis, hæmoptysis, and menorrhagia, are the forms of hemorrhage more frequently benefited by the use of foxglove.

5. *Diseases of the Heart and Great Vessels.*—An important indication in the treatment of many diseases of the heart and great vessels is to reduce the force and velocity of the circulation. The most effectual means of fulfilling this indication are,—the adoption of a low diet, repeated blood-letting, and the employment of foxglove. There are, perhaps, no diseases in which the beneficial effects of foxglove are more marked, than in those of the heart and great vessels. In *aneurism of the aorta*, our only hope of cure is by the coagulation of the blood in the aneurismal sac, and the consequent removal of the distensive pressure of the circulation. To promote this, we endeavour to retard the movement of the blood within the sac, by diminishing the quantity of blood in the system generally, and by reducing the force and velocity with which it circulates. Blood-letting and digitalis are, in these cases, very important agents; and under their use cases now and then recover. Again, in *simple dilatation* of the cavities of the heart, our objects are to remove, if possible, the cause (usually obstruction in the pulmonic or aortic system), to strengthen the muscular fibres of the heart, and to repress any preternatural excitement of the vascular system. Digitalis is useful to us in attaining the latter object. In *simple hypertrophy*, or *hypertrophy with dilatation*, we have to reduce the preternatural thickness of the heart's parietes, and this we do by removing, when it can be done, any obstruction to the circulation, by using a low diet, by repeated blood-letting, and by the employment of foxglove. No means, says Dr. Davies (*Lond. Med. Gaz.* vol. xv. p. 790), excepting the abstraction of blood, diminishes the impulsion of the heart so completely and so certainly as digitalis. "I have been," adds he, "in the habit of using it for several years for these affections, and have rarely seen it fail in producing at least temporary relief." "The enlarged and flaccid heart," observes Dr. Holland (*Med. Notes and Reflect.* p. 574), "though, on first view, it might seem the least favourable for the use of the medicine, is, perhaps, not so. At least we have reason to believe, that, in dropsical affections, so often connected with this organic change, the action of digitalis, as a diuretic, is peculiarly of avail." *In some disordered conditions of innervation of the heart and great vessels*—as in angina pectoris, nervous palpitations of the heart, and augmented arterial impulsion, foxglove is also at times beneficial. In patients affected with an intermittent or otherwise irregular pulse, I have several times observed this medicine produce

regularity of pulsation;—a circumstance also noticed by Dr. Holland. Besides the preceding, there are *various other affections of the heart* in which foxglove may be found serviceable, either by its sedative influence over the circulation, or by its power of relieving dropsical effusion through its diuretic property.

6. *In Phthisis.*—Digitalis has been declared capable of curing pulmonary consumption, and numerous cases of supposed cures have been published. Bayle (*Bibl. Thérap.* t. iii. p. 362) has collected from the writings of Sanders (*op. ante cit.*) Kinglake, Fowler, Beddoes (*Observ. on the Management of the Consumptive*, 1801), Drake, Mossman (*Essay to elucidate the Nat. Orig. and Connex. of Scroph. and Gland. Consumpt.*), Maclean, Ferriar (*On Digitalis*), Magennis, Moreton, and others, reports of 151 cases treated by foxglove. Of these, 83 are said to have been cured, and 35 relieved. But a more accurate and extended experience has fully proved, that this medicine possesses no curative, and very slight palliative, powers in genuine phthisis: it is totally incapable of preventing or of causing the removal of tubercular deposits, and has little, if any influence, in retarding the progress of consumption. Its power of diminishing the rapidity of the circulation cannot be doubted; but this effect is, as Dr. Holland (*op. cit.* p. 551) justly remarks, "of less real moment than is generally supposed."

7. *In Insanity and Epilepsy.*—In these maladies foxglove may prove occasionally serviceable by repressing excessive vascular excitement, which sometimes accompanies them. Furthermore, the specific influence of this remedy over the cerebro-spinal system may now and then contribute to the beneficial operation of foxglove. But the precise nature of this influence not having as yet been accurately ascertained, while the pathology of the above-mentioned diseases is involved in considerable obscurity, it follows that the therapeutic value of this influence can only be ascertained empirically. In insanity, Dr. Hallaran (*Inquiry*, &c. *with Observ. on the Cure of Insanity*, 1810) recommends foxglove to reduce vascular action after the employment of depletion and purgation. It has been used in this disease, with success, by Dr. Currie (*Mem. of the Med. Soc. of London*, vol. iv.), and by Fanzago (quoted by Bayle, *Bibl. Thérap.* t. iii. p. 320). In epilepsy it is, I conceive, less likely to be serviceable, because this disease is less frequently accompanied with the vascular excitement, against which foxglove is most successful. Accordingly, while in some few cases it has proved serviceable (Scott, *Ed. Med. and Surg. Journ.* Jan. 1827), in others it has either been unsuccessful (Percival, *Ibid.* vol. ix. p. 274), or has only given temporary relief (Currie, *op. supracit.*)

8. *In various other diseases.*—Besides the preceding, there are several other maladies against which foxglove has been employed with occasional benefit, as *scrofula* (Haller, Merz, Schiemann, and Hufeland, quoted by Bayle, *Bibl. Thér.* t. iii. p. 369) and *asthma* (Ferriar, *On Digitalis*, 1799; Fogo [asthma cured by an overdose of foxglove], *Ed. Med. and Surg. Journ.* vol. xviii. p. 345). For other diseases relieved by foxglove I must refer the reader to the works of Murray (*App. Med.* vol. i.) and Bayle (*op. supracit.*)

Administration.—The ordinary dose of foxglove, *in powder*, is from gr. ss. to gr. iss. repeated every six hours.

1. *Infusum Digitalis*, L. E. D.—(Foxglove leaves, dried, j. [ʒij. *E.*];

Spirit of Cinnamon, f℥j. [f℥ij. E. ℥ss. *D.*]; Boiling [distilled, *L.*] Water, Oj. [f℥xviij. *E.* Oss. *D.*] Macerate the foxglove leaves in the water for four hours, in a vessel lightly covered, and strain [through linen or calico, *E.*]; then add the spirit of cinnamon). I believe this, when properly made, to be the most effectual of the preparations of foxglove. The dose of it is from f℥ss. to f℥j. repeated every six hours. I have known it given to the extent of f℥ij.

2. *Tinctura Digitalis*, L. E. D.—(Foxglove leaves [rejecting the larger ones, *D.*], dried [in moderately fine powder, *E.*; coarsely powdered, *D.*), ℥iv. [℥ij. *D.*]; Proof Spirit, Oij. [Oj. wine measure, *D.*] Macerate for fourteen days [seven, *D.*], and strain. "This tincture is best prepared by the process of percolation, as directed for the Tincture of Capsicum. If forty fluidounces of spirit be passed through, the density is 944 [0·944], and the solid contents of a fluidounce amount to twenty-four grains. It may also be made by digestion," *E.*) The usual dose of this preparation, for an adult, is from ♏x. cautiously increased to ♏xl., repeated every six hours. I usually begin with ♏xx. The largest dose I have employed is f℥j.; but, as I have already stated, it has been given to the extent of one ounce! The colour of this preparation is somewhat affected by exposure to strong solar light.

3. *Extractum Digitalis*, L. E. — (Fresh Foxglove leaves, lb. j. Bruise them, sprinkled with a little water, in a stone mortar; then press out the juice, and evaporate it, unstrained, to a proper consistence, *L.* —"This extract is best prepared from the fresh leaves of digitalis, by any of the processes indicated for extract of Conium," *E.*) Recently introduced into the pharmacopœias of London and Edinburgh. Its preparation requires very great care and attention, or the virtues of the plant may be destroyed during the process. Dose, gr. j. cautiously increased.

4. *Pilulæ Digitalis et Scillæ*, *E.*—(Digitalis; Squill, of each, ℈j.; Aromatic Electuary, ℈ij. Beat them into a proper mass with conserve of red roses; and divide the mass into twenty pills). A valuable diuretic compound. Used in dropsies. Dose, one or two pills.

Antidotes.—In a case of poisoning by foxglove, or its preparations, expel the poison from the stomach by the stomach-pump or by emetics, if vomiting should not have already commenced; assist the vomiting, when it is established, by the use of diluents; and counteract the depressing influence of the poison on the circulation by the use of ammonia and brandy; and keep the patient in a recumbent posture, to guard against syncope. I am unacquainted with any chemical antidote for foxglove: perhaps infusion of nutgalls or green tea might prove serviceable, especially if the active principle of this plant be an alkali.

Verbas'cum Thap'sus, Linn. D.—*Great Mul'lein* or *High Taper.*

Sex. Syst. Pentandria, Monogynia.

(Folia, *D.*)

History.—This plant is, according to Sprengel (*Hist. Rei Herb.* vol. i. p. 161), the φλόμος θήλεια of Dioscorides (lib. iv. cap. 104).

Botany. *Gen. Char.*—*Calyx* campanulate, five-partite, nearly equal. *Corolla* with a very short tube; the limb flat, expanded, somewhat rotate, five-partite; the lobes rounded, nearly equal, or the lower ones equal.

Stamens five, inclining; the lower ones longer; all fertile; the *filaments* either all, or the three upper, barbate: *anthers* generally adnate, and (by the confluence of the cells) unilocular. *Style* simple, thick at the apex. *Stigma* entire or bifid. *Capsule* ovate or somewhat globose; the valves bifid at the apex (Macreight).

Sp. Char.—*Leaves* decurrent, crenate, woolly on both sides. *Stem* simple. *Cluster* dense. *Flowers* almost sessile (Smith).—*Corolla* golden-yellow; *stamens* red; *stigma* green.

Hab.—Indigenous: on banks and waste ground. Biennial. Flowers in July and August.

Description.—The leaves (*folia verbasci*) have a mucilaginous, bitterish taste, and a very slight odour. They communicate their virtues to water.

Composition.—Morin (*Journ. de Chim. Méd.* t. ii. p. 223) analyzed the flowers of Verbascum Thapsus, and obtained *a yellow volatile oil, a fatty acid, free malic and phosphoric acids, malate and phosphate of lime, acetate of potash, uncrystallizable sugar, gum, chlorophylle*, and *yellow resinous colouring matter.*

Physiological Effects.—Emollient, demulcent, and, supposed to be, feebly narcotic. Fishes are stupified by the seeds of Verbascum (Bergius, *Mat. Med.*)

Uses.—In the form of decoction (prepared of ℥ij. of the leaves and Oij. of water) mullein has been used in catarrhs and diarrhœas: the dose is f℥iv. Dr. Home (*Clin. Exp. and Hist.*) found it serviceable in the latter complaint only. Fomentations and cataplasms made of great mullein, have been used as applications to hemorrhoidal tumors and indurated glands.

Scrophula'ria nodo'sa Linn. D.—*Knotty-rooted Fig'wort.*

Sex. Syst. Didynamia, Angiospermia.

(Folia, *D.*)

History.—The earliest notice of this plant occurs in the work of Brunfels (Sprengel, *Hist. Rei Herb.* Præf. xi.)

Botany. *Gen. Char.*—*Calyx* five-parted or more frequently five-cleft, nearly equal. *Corolla* globose, with a short five-lobed limb, the segments of which are rounded, and the uppermost united into an upper lip. *Stamens* didynamous, inclining, with one-celled, transverse anthers; a fifth rudimentary stamen with a lamelliform anther, often present. *Stigma* emarginate. *Capsule* roundish, often acuminate, with the valves entire, or just bifid (Lindley).

Sp. Char.—*Leaves* heart-shaped, acute; three-ribbed at the base. *Stem* sharp-edged. *Root* tuberous. (Smith.)—*Corolla* dull green, with a livid purple lip.

Hab.—Indigenous: hedges, woods, and thickets. Perennial. Flowers in July.

Description.—The fresh leaves (*folia scrophulariæ nodosæ*) have, when bruised, a fetid odour: their taste is bitter, and somewhat acrid. Water extracts the virtues of the plant: the infusion is darkened by the sesquichloride of iron, but is unchanged by tincture of nutgalls.

Composition.—The whole plant (root and herb) was analysed in 1830 by Grandoni (*Pharm. Central-Blatt für* 1831, S. 446). He obtained *brown bitter resin* 0·31, *extractive with gum* 4·84, *extractive having the odour of benzoic acid* 0·88, *chlorophylle* 1·58, *starch* 0·23, *greenish fecula* 0·18, *mucilage* 0·27, *inulin* 0·16, *malic acid* 0·15, *pectic acid* 0·15, *acetic acid* 0·13, *woody fibre* 19·80, *water* 70·31, *sulphate and carbonate of potash* 0·59, *alumina* 0·20, *oxalate and carbonate of lime* 0·46, *magnesia* 0·26, *silica* 0·07, *odorous matter* and *loss* 0·31.

Physiological Effects.—But little known. Judging from their taste, the leaves possess acrid properties. When swallowed they occasion vomiting and purging. They are said to be diuretic and narcotic.

Uses.—Rarely employed. In the form of a fomentation the leaves are sometimes applied to piles and other painful tumors. The ointment is used in skin diseases. The tuberous root was formerly esteemed in scrofula (Murray, *App. Med.* vol. ii. p. 224).

Unguentum Scrophulariæ, D.—(Fresh leaves of Scrophula ia nodosa; Prepared Hog's Lard, of each, ℔ij.; Prepared Mutton Suet, ℔.j. Boil the leaves in the fat until they become crisp, then strain by expression.) Recommended by Dr. W. Stokes (*Dubl. Med. Essays*, p. 146) for the cure of a disease of children, commonly termed *burnt-holes*, but which he calls *Pemphigus gangrenosus* [*Rupia escharotica?*]. It has also been used in tinea capitis, impetigo, and other cutaneous affections (Dr. Montgomery, *Observ. on the Dubl. Pharm.*)

Other Medicinal Scrophulariaceæ.

Grati'ola officina'lis, or *Hedge Hyssop*, is cathartic, diuretic, and emetic, acting in large doses as an acrid poison. It has been used in visceral obstructions, liver affections, dropsies, scrofula, and venereal diseases. Dose of the *powder*, gr. xv. to ℈ss.: of the *infusion* (prepared with ʒij. of the dried herb and Oss. of boiling water), f℥ss. to f℥j. three times a day (Thomson, *Lond. Dispensat.*)

Veron'ica Beccabun'ga, or *Brooklime*, is considered antiscorbutic. It may be eaten as a salad.

Euphra'sia officina'lis, or *Common Eye-bright*, is nearly inert, though it is a popular remedy for diseases of the eyes.

Order 35. Solana'ceæ, *Lindley*.—The Nightshade Tribe.

Solaneæ, *Jussieu*.

Essential Character.—*Calyx* five-parted, seldom four-parted, persistent, inferior. *Corolla* monopetalous, hypogynous; the limb five-cleft, seldom four-cleft, regular, or somewhat unequal, deciduous; the æstivation plaited or imbricated. *Stamens* inserted upon the corolla, as many as the segments of the limb, with which they are alternate; *anthers* bursting longitudinally, rarely by pores at the apex. *Ovary* two-celled, rarely four- or many-celled, with two polyspermous placentæ; *style* continuous; *stigma* simple. *Pericarp* with two or four, or many cells, either a capsule with a double dissepiment parallel with the valves, or a berry with the placentæ adhering to the dissepiment. *Seeds* numerous, sessile; *embryo* straight or curved, often out of the centre, lying in a fleshy *albumen*; *radicle* next the hilum.—*Herbaceous* plants or *shrubs*. *Leaves* alternate, undivided, or lobed, sometimes collateral; the floral ones sometimes double, and placed near each other. *Inflorescence* variable, often out of the axil; the *pedicels* without bracts (Lindley).

Properties.—Not uniform. 1. *Narcotics* (*cerebro-spinants*, Pereira, p. 66) are obtained from the genera Hyoscyamus, Atropa, Datura, Nicotiana, Solanum, and Mandragora: of these some are also acrids (*acro-narcotic solaneæ*). 2. *Acro aromatics* are procured from the genus Capsicum. 3. *Bitter-tonics* are found in the genera Solanum (as S. Pseudoquina and crispum), and Cestrum (C. diurnum). 4. *Nutrients* are obtained from the genus Solanum (as S. Lycopersicum, Melonzena, and tuberosum.) The heat used in preparing some of these for the table may, perhaps, volatilize or decompose any noxious matter which they contain. The generalizations of some late French writers (vide Trousseau and Pidoux, *Traité de Thérap.* t. i. p. 206) with respect to the identity of the operation of the narcotic Solaneæ, do not appear to me to be founded in fact. Hyoscyamus, Belladonna, and Stramonium, agree in causing dilatation of the pupil, and in producing delirium. Hyoscyamus, given in moderate doses, sometimes occasions sleep, though this has been denied. Tobacco depresses the muscular and vascular systems.

Hyoscy'amus ni'ger, Linn. L. E. D.—*Common Hen'bane.*

Sex. Syst. Pentandria, Monogynia.

(Folia et Semina, *L.*—Leaves, *E.*—Folia, *D.*)

History.—This plant is the Ὑοσκύαμος μέλας of Dioscorides (lib. iv. cap. 69). The Ὑοσκύαμος of Hippocrates is probably *Hyoscyamus albus* (Dierbach, *Arzneim. d. Hippocrates*, p. 233).

Botany. *Gen. Char.*—*Calyx* tubular, five-cleft. *Corolla* funnel-shaped; limb spreading, oblique, five-lobed, unequal. *Stamina* five. *Stigma* capitate. *Capsule* ovate, compressed and furrowed on each side; apex circumscissile or operculate (*Bot. Gall.*)

Sp. Char.—*Leaves* sinuated, clasping the stem. *Flowers* sessile (Smith).

Root spindle-shaped. *Stem* bushy. *Leaves* sessile, soft and pliant, sharply lobed, downy, and viscid, exhaling a powerful and oppressive odour, like all the rest of the plant. *Flowers* numerous from the bosoms of the crowded upper leaves, almost entirely sessile, of an elegant straw colour, pencilled with dark-purple veins.

Hab.—Indigenous: waste ground, banks, and commons. Flowers in July.

There are two varieties of this species; one biennial, the other annual. Both are cultivated at Mitcham.

Description.—Mr. Houlton (*Lond. Med. Gaz.* vol. vii. p. 509) says the plant is fit for medicinal purposes in the second year only of its duration. It should be gathered when in full flower. The herb (*herba hyoscyami*), when fresh, has a strong, unpleasant, narcotic odour, a mucilaginous, slightly acrid taste, and a clammy feel. By drying it almost wholly loses these properties. One hundred pounds of the fresh herb yield about fourteen pounds when dried (Martius, *Pharmakogn.*) The leaves (*folia hyoscyami*), when fresh, are pale, dull green. The seeds (*semina hyoscyami*) are small, compressed, uniform, roundish, finely dotted, of a yellowish-gray colour, and have the odour of the plant, and an oleaginous, bitter taste.

Composition.—The seeds of Hyoscyamus niger were analyzed, in 1816, by Kirchhof (*Berl. Jahrb.* Bd. xvii. S. 144); and, in 1820, by Brandes (*Ibid.* Bd. xxi. S. 280). The extract of the herb was analyzed by Lindbergson (Gmelin, *Handb. d. Chem.* ii. 1303).

Brandes's Analysis.

Fatty oil	24·2
Waxy fat	1·4
Resin insoluble in ether	3·0
Malate of hyoscyamia with malates of lime and magnesia, and a salt of potash and ammonia	6·3
Uncrystallizable sugar	a trace
Gum 1·2, Bassorin 2·4, and Starch 1·5	5·1
Albumen	4·5
Vegeto-animal matter	3·4
Malate, phosphate, sulphate, and muriate of potash	0·4
Malates of lime and magnesia	0·6
Phosphates of lime and magnesia	2·4
Woody fibre	26·0
Water	24·1
Seeds of Hyoscyamus	101·4

The ashes contained carbonate, phosphate, sulphate, and muriate of potash, carbonate and much phosphate of lime, much silica, manganese, iron, and minute traces of copper.

Lindbergson's Analysis.

Narcotic extractive soluble in water and alcohol.
Bitter extractive.
Gummy extractive.
Malates, phosphates, sulphates, and muriates of potash and magnesia.

Extract of the herb.

1. *Hyoscyamia* or *Hyoscyamina.*—This term has been applied to a vegetable alkali procured from the seeds and herb of Hyoscyamus niger by Brandes (*Pharm. Central-Blatt für* 1832, S. 479), whose statements have been confirmed by Geiger and Hesse, as well as by Mein (*Journ. de Pharm.* t. xx. p. 87, and *Pharm. Centr.-Blatt für* 1835, S. 83). However, Chevallier, as well as Brault and Poggiale (*Journ. de Pharm.* t. xxi. p. 134) have failed to procure it. The properties assigned to it are almost identical with those of Atropina, from which it differs in being more soluble in water. It is crystallizable, has an acrid taste, and, when volatilized, yields ammonia. Reisinger (*Arch. Gén. de Méd.* t. xviii. p. 301) says, that a drop of a solution of one grain of this substance in ten grains of water causes dilatation of the pupil, but does not give rise to irritation of the eye. A solution of double this strength acted as an irritant.

2. *Empyreumatic Oil of Henbane* (*Pyro-Hyoscyamina?*).—This was obtained by Dr. Morries (*Ed. Med. Surg. Journ.* vol. xxxix. p. 379) by the destructive distillation of henbane. Its chemical properties are identical with those of the empyreumatic oil of foxglove. It proved a powerful narcotic poison.

Physiological Effects. (*a.*) *On vegetables.*—Water holding in solution extract of henbane proved poisonous to Hyoscyamus niger (Macaire, quoted by Decandolle, *Phys. Vég.* p. 1354).

(*b.*) *On animals.*—Its effects on herbivorous animals are slight. Given to horses, in large quantities, it causes merely dilatation of the pupils, spasmodic movements of the lips, and frequency of pulse (Moiroud, *Pharm. Vét.* p. 349: see also Viborg, in Wibmer's *Wirk. d. Arzn. ü. Gift.* Bd. iii. S. 156). On dogs its effects appear to be analogous to those on man (Orfila, *Tox. Gén.*) It does not cause any local irritation. Its constitutional effects are, dilatation of pupil, weakness of the posterior extremities, staggering, and insensibility.

(*c.*) *On man.*—*In small and repeated doses* henbane has a sedative and tranquillizing effect. This is especially observed in persons suffering with great nervous irritability, and with a too active condition of the sensorial functions. In such it frequently causes calmness, with a tendency to sleep. It frequently allays irritation and preternatural sensibility existing in any organ. It does not quicken the pulse, check secretion, or cause constipation. *Large doses* sometimes induce sleep. Fouquier (*Arch. Gén. de Méd.* t. i. p. 297), however, denies this. He says, henbane causes headache, giddiness, dimness of sight, dilatation of pupil, a greater or less tendency to sleep, and painful delirium. In some cases these symptoms are followed by thirst, nausea, griping, and either purging or constipation; and, in a few instances, febrile heat and irritation of skin are induced. But I have frequently seen it cause sleep, though its hypnotic properties are neither constant nor powerful. It more frequently fails to occasion sleep in those accustomed to the use of opium. Very large doses are apt to be followed by delirium rather than by sleep. Its power of alleviating pain and allaying spasm is greatly inferior to that of opium. *In poisonous doses* it causes loss of speech, dilatation of the pupil, disturbance of vision, distortion of the face, coma, and delirium (the *typhomania* of some authors) generally of the unmanageable, sometimes of the furious kind, and paralysis, occasionally with convulsive movements. Irritation of the stomach and bowels (manifested by nausea, vomiting, pain, and purging) is occasionally induced.—(For abstracts of cases illustrative of their effects, consult Orfila, *Toxicol. Gén.* and Wibmer, *Wirk. d. Arzneim. ü. Gift.*)

In its operation on the body, henbane presents several peculiarities. From opium it is distinguished by the sedative, rather than stimulant, effects of small doses; by its not confining the bowels; by the dimness of sight; and, when swallowed in large doses, by its producing dilatation of the pupil, and by its being more apt to occasion delirium. The last-mentioned peculiarity is noticed by Dr. Cullen (*Mat. Med.* ii. p. 272). Furthermore, in some individuals, opium causes headache, and other distressing symptoms, which henbane is not so apt to produce. From belladonna and stramonium, to which it is in several respects closely allied, it is distinguished by the very rare occurrence of any symptoms of gastro-intestinal irritation after the ingestion of large doses of it. Sundelin (*Handb. d. sp. Heilm.* Bd. i. S. 463, 3te Aufl.) says, "that it wants the resolvent operation and the stimulant influence over the vascular system which belladonna possesses." Vogt (*Lehrb. d. Pharmakod.* Bd. i. S. 170, 2te Aufl.) ranks hyoscyamus between belladonna and hydrocyanic acid. But, with every respect for the opinions of so profound a writer, I cannot concur in the propriety of this arrangement. I have never seen, from the use of hydrocyanic acid, the same tranquillizing and soothing influence over the mind and external senses which I have repeatedly witnessed from the use of small doses of hyoscyamus; and the effects of poisonous doses of these two agents more strikingly display the difference of their operation; for, while hydrocyanic acid causes insensibility and convulsion, henbane produces delirium and paralysis.

Uses.—Hyoscyamus is said to alleviate pain and irritation in various organs, to promote sleep, to procure quietude, and to obviate spasm. For any of these objects it is greatly inferior to, and less confidently to be relied on than, opium. Yet it is, on various occasions, preferred to the latter; as where opium causes headache, or other distressing cerebral symptoms, or where it occasions constipation. Again, the stimulant influence of small doses of opium over the vascular system, and the tendency of this narcotic to lock up the secretions and excretions, form objections to its use in the maladies of children; in such, therefore, hyoscyamus is frequently preferred. Fouquier, whose observations with respect to the effects of henbane I have already had occasion to refer to, can find in this narcotic no useful property; and he thinks it ought to be banished from the Materia Medica (*op. cit.* p. 312).

The following are the principal purposes for which it is ordinarily employed in this country:—

1. *As an anodyne* where opium disagrees, or is from any circumstance objectionable. It may be used in neuralgia, rheumatism, gout, periostitis, the milk-abscess, painful affections of the urino-genital organs, scirrhus, and carcinoma.

2. *As a soporific* it is available in sleeplessness, accompanied with great restlessness and mental irritability, and where opium, from its stimulant or other properties, proves injurious. Sometimes, where it fails to cause actual sleep, it proves highly serviceable by producing a calm and tranquil state conducive to the well-doing and comfort of the patient.

3. *As an antispasmodic* it occasionally proves serviceable in spasmodic affections of the organs of respiration (*e. g.* spasmodic asthma), and of the urino-genital apparatus (*e. g.* spasmodic stricture and spasm of the sphincter vesicæ). Notwithstanding the favourable reports of Storck to the contrary, it is rarely calculated to be of any service in epilepsy.

4. *As a sedative*, to allay irritation and preternatural sensibility. In troublesome cough it sometimes proves useful by dulling the sensibility of the bronchial membrane to the influence of the cold air. In nephritic and vesical irritation, and in gonorrhœa, it is sometimes a useful substitute for opium. In the irritation of teething it is valuable from its power of relieving pain and convulsion. Its advantages over opium, in the disorders of children, have been already pointed out.

5. *To dilate the pupil* the extract may be used as a substitute for extract of belladonna, than which it is less powerful.

6. *As a topical sedative and anodyne*, fomentations of the herb, or the extract, are sometimes applied to painful glandular swellings, irritable ulcers, hemorrhoids, and parts affected with neuralgia. In irritation of the rectum or bladder it is sometimes used per anum.

ADMINISTRATION.—The *powder* of the leaves is rarely employed: the dose is from three to ten grains. The *extract* and *tincture* are the preparations commonly used.

1. *TINCTURA HYOSCYAMI*, L. E. D.—(Henbane leaves, dried, [in moderately fine powder, *E.*] ℥v. [℥iij. *E.*]; Proof Spirit, Oij. [Oiss. *E.*] Macerate for fourteen [seven, *D.*] days, and strain. "This tincture is best prepared by the process of percolation, as directed for Tincture of Capsicum; but it may also be obtained, though with greater loss, by the process of digestion," *E.*) Dose, f℥ss. to f℥ij.

2. *EXTRACTUM HYOSCYAMI*, L. E.; *Succus spissatus Hyoscyami*, D.—(Fresh Henbane leaves, lb. j. Bruise them, sprinkled with a little water, in a stone mortar; then press out the juice, and evaporate it, unstrained, to a proper consistence, *L.* "This extract is to be prepared from the fresh leaves of hyoscyamus by any of the processes directed for Extract of Conium," *E.* The *Dublin College* orders it to be prepared from the fresh plant of henbane, in the manner directed for the *Succus spissatus Aconiti*). The average produce of extract is from 4 to 5 lbs. from 112 lbs. of the fresh herb (Brande, *Dict. Mat. Med.* p. 312). The quality

of this preparation, as met with in the shops, is extremely variable. This arises principally from the unequal care with which it has been prepared. The dose is from gr. v. to ℈j. Occasionally very much larger doses have been taken without any injurious effects. It is said to be a valuable addition to the compound extract of colocynth, whose operation it renders milder, though not less efficacious. It is sometimes used as a topical application to inflamed or tender parts: thus, alone, or in the form of ointment, it is applied to painful hemorrhoids; spread on linen it forms a plaster, which has been used in neuralgia, rheumatic pains, painful glandular swellings, &c.

Antidotes.—The treatment of a case of poisoning by henbane is the same as that by opium.

At'ropa Belladon'na, Linn. L. E. D., *Common Dwale; Deadly Nightshade.*

Sex. Syst. Pentandria, Monogynia.

(Folia, *L.*—Leaves, *E.*—Folia et radix, *D.*)

History.—Some persons have suggested that this plant may be the *μανδραγόρας* of Theophrastus (*Hist. Pl.* lib. vi. cap. 2,) the fruit of which, this ancient botanist says, "is black, racemed, and, to the taste, vinous." But the plant noticed under this name by Dioscorides, (lib. iv. cap. 76), had yellow fruit, and is universally admitted to be the *Mandragora officinalis.* The earliest undoubted notice of belladonna occurs in the work of Tragus (A.D. 1532,) who calls it *Solanum hortense nigrum* (Bauhin, *Pinax*). It has been supposed that it was this plant which produced such remarkable and fatal effects on the Roman soldiers, during their retreat from the Parthians (see Plutarch's *Life of Antony*). Buchanan (*Rerum Scot. Hist.* lib. vii.) relates, that the Scots mixed the juice of this plant with the bread and drink, which, by their truce, they were to supply the Danes with, which so intoxicated them, that the Scots killed the greatest part of Sweno's army while asleep. Shakspeare (*Macbeth*, Act i. Scene 3d) is supposed to allude to it under the name of the *insane root.*

Botany. *Gen. Char.*—*Calyx* campanulate, five-cleft. *Corolla* campanulate, twice the length of the calyx, five-lobed, equal. *Filaments* five, filiform. *Berry* globose, seated in the calyx (*Bot. Gall.*)

Sp. Char.—*Stem* herbaceous. *Leaves* ovate, undivided. *Flowers* solitary (Smith).

Root fleshy, creeping. Whole plant fetid when bruised, of a dark and lurid aspect, indicative of its deadly narcotic quality. *Stems* herbaceous, annual, three feet high, round, branched, leafy, slightly downy. *Leaves* lateral, mostly two together of unequal size, ovate, acute, entire, smooth. *Flowers* imperfectly axillary, solitary, stalked, drooping, dark dull purple in the border, paler downwards, about an inch long. *Berry* of a shining violet black, the size of a small cherry, sweetish, and not nauseous (Smith.)

Hab.—Indigenous: hedges and waste ground, on a calcareous soil. Flowers in June.

Description.—The root (*radix belladonnæ*), when fresh, is one or more inches thick, and sometimes a foot or more long: it is branching, fleshy, internally white, externally grayish or brownish-white. Its taste is slight, sweetish: its odour is feeble. It may be collected in the autumn or early in the spring. The flowering stems (*herba belladonnæ*) are collected in June or July; they are then deprived of leaves (*folia bella-*

donnæ), which are to be carefully dried. The leaves, when fresh, have a feeble, bitterish, sub-acid taste.

Composition.—The *leaves* of belladonna were analyzed, in 1808, by Melandri (*Ann. de Chim.* lxv. 222); the *expressed juice*, in 1809, by Vauquelin (*Ibid.* lxxii. 53); and the *dried herb*, in 1819, by Brandes (Gmelin's *Handb. d. Chem.* ii. 1305). Besides these there have been several less complete examinations of this plant by other chemists, which have yielded more or less interesting results.

Brandes's Analysis.

Supermalate of Atropia	1·51
Pseudo-toxin with malate of atropia and potash salts	16·05
Wax	0·70
Chlorophylle	5·84
Phytocolla (a nitrogenous substance insoluble in alcohol)	6·90
Gum	8·33
Starch	1·25
Albumen	10·70
Liguin	13,70
Salts	7·47
Water	25·50
Loss	2·05
Dried herb of Belladonna	100·00

1. *Atropia* (*Atropina* seu *Atropium*).—The most improved processes for extracting this vegetable alkali are those of Mein (*Pharm. Central-Blatt für* 1833, S. 771, and Thomson, *Org. Chem.* p. 274), and Richter (*Pharm. Central-Blatt für* 1837, S. 613). By the first, 12 oz. of belladonna root yielded not quite 12 grains of pure atropia. This vegetable alkali crystallizes in transparent silky prisms. It is odourless, soluble in alcohol, ether, and very slightly so in water. The solution is bitter, restores the blue colour of reddened litmus paper, is precipitated white by infusion of nutgalls, yellow by chloride of platinum, and yellow by chloride of gold: the precipitate caused by the latter assumes a crystalline appearance. At a temperature above 212° F. it is converted into vapour, which is deposited like a coat of varnish. Heated in the open air, it readily becomes empyreumatic. It dissolves in acids, with which it unites to form salts. The *hydrochlorate* and *sulphate* are crystallizable (Geiger and Hesse, *Pharm. Central-Blatt für* 1835, S. 81). Two analyses of it have been made by Liebig: according to the latest, its composition is $C^{34}\ H^{23}\ N\ O^{6}$; hence its atomic weight is 289 (*Ibid.*) Atropia is a powerful poison. An imponderable quantity is sufficient, when applied to the eye, to cause dilatation of the pupil. Given to dogs and cats it caused vomiting, dilatation of the pupil, and stupor. A tenth of a grain caused, in the human subject, dryness of the mouth, constriction of the throat, difficulty of swallowing, stupor, dilatation of pupil, and headache (*Ibid. für* 1833, S. 775).

2. *Pseudotoxin.*—A substance obtained by Brandes from the watery extract of belladonna. It is brownish-yellow, soluble in water, insoluble in absolute alcohol and in ether, is coloured green by the salts of iron, and is totally precipitated from its watery solution by the salts of lead and by tincture of galls (Gmelin, *Handb. d. Chem.* ii. 1032).

3. *Belladonnin.*—Under this name Luebekind (*Pharm. Centr.-Blatt für* 1839, S. 448) has described a volatile vegetable alkali, which, he says, is distinct from atropia. It is crystallizable, and has an ammoniacal odour. It consists of Carbon 28·5, Hydrogen 22·4, Nitrogen 32·1, Oxygen 17·0. The crystals contain three equivalents of Water. Two grains caused extreme heat in the throat and constriction of the larynx.

4. *Atropic acid.*—This name has been given by Richter (*Pharm. Centr.-Blatt für* 1837, S. 614) to a volatile, crystallizable acid, distinguished from benzoic acid by its not precipitating the salts of iron.

Physiological Effects. (*a.*) *On vegetables.*—An aqueous solution of extract of belladonna is poisonous to plants (Marcet, *Ann. Chim. et Phys.*

vol. xxix. p. 200; and Schübler and Zeller, *Schweigger's Journ. f. d. Chem.* 1827, B. 50, S. 54-66).

(*b.*) *On animals generally.*—Belladonna proves poisonous to mammals and birds; but much less so to herbivorous than to carnivorous animals. Eight pounds (Troy) of the leaves have been eaten by a horse without any ill effects (Moiroud, *Pharm. Vét.* p. 344). A pound of ripe berries has been given to an ass with very little effect (Viborg, in Wibmer, *Wirk. d. Arz. ü Gift.* Bd. i. S. 366). Given to dogs, belladonna causes dilatation of pupil, plaintive cries, efforts to vomit, weakness of the posterior extremities, staggering, frequent pulse, a state like intoxication, and death (Orfila, *Toxicol. Gén*). Forty or fifty grains of the watery extract, injected into the jugular vein of dogs, have proved fatal (*Ibid.*) Flourens (*Rech. Expér.* 1824) thinks that the *tubercula quadrigemina* are the parts of the nervous centres on which this poison specifically acts. His inferences were drawn from experiments made on birds. The topical action of belladonna is that of an acrid, though not a very violent one (Orfila, *supracit.*)

(*c.*) *On man.*—*In the first degree* of its operation, belladonna diminishes sensibility and irritability. This effect (called by some *sedative*) is scarcely obvious in the healthy organism, but is well seen in morbid states, when these properties are preternaturally increased. A very frequent and sometimes the earliest obvious effect of belladonna is dryness of the mouth and throat, frequently attended with thirst. The other secretions and the circulation are oftentimes not affected, though occasionally they are augmented. Mr. Bailey (*Observ. relat. to the Use of Belladonna*, p. 9, 1818) "asserts that belladonna affects neither the stomach nor bowels, nor any of the secretions nor excretions, those of the salivary glands excepted." The asserted influence of belladonna over the organic functions is said to be shewn by its power of inducing, in some cases, resolutions of swellings and tumors of various kinds, as will presently be noticed.

In the second degree of its operation belladonna manifests, both in healthy and morbid conditions, its remarkable influence over the cerebro-spinal system. It causes dilatation of the pupils, obscurity of vision, or absolute blindness (amaurosis), visual illusions, suffused eyes, occasionally disturbance of hearing (as singing in the ears, &c.) numbness of the face, confusion of head, giddiness, and delirium, which at times resembles intoxication, and may be combined with or followed by sopor. These symptoms are usually preceded by a febrile condition, attended with a remarkable affection of the mouth, throat, and adjacent parts. Besides dryness of these parts, it causes difficulty of deglutition and of articulation, a feeling of constriction about the throat, nausea, and sometimes actual vomiting, and, now and then, swelling and redness of the face. The pulse is usually hurried and small. The cutaneous, renal, and mucous secretions are frequently augmented. An exanthematous eruption, like that of scarlet fever, has been noticed; and irritation of the urinary organs has in some instances occurred (Jolly, *Nouv. Bibl. Méd.* 1828, iii.; and *Lancet*, 1828-9, vol. i. p. 45).

In some cases very severe effects have been induced by the application of the extract to abraded surfaces (Wade, *Med. and Phys. Journ.* vol. lvii. p. 286, 1827; Davies, *Lect. on Dis. of the Lungs and Heart*, p. 496). The continued application of it to the sound skin has also been attended with similar effects (Bacot, *Lond. Med. and Phys. Journ.* vol. xxiv. p. 383, 1810).

In the third degree of its operation, belladonna produces effects similar to the preceding, but in a more violent form. The following are the symptoms experienced by above 150 soldiers, who were poisoned by the berries of belladonna, which were gathered at Pirna, near Dresden:—"Dilatation and immobility of the pupil; almost complete insensibility of the eye to the presence of external objects, or at least confused vision; injection of the conjunctiva with a bluish blood; protrusion of the eye, which in some appeared as if it were dull, and in others ardent and furious; dryness of the lips, tongue, palate, and throat; deglutition difficult or even impossible; nausea not followed by vomiting; feeling of weakness, lipothymia, syncope; difficulty or impossibility of standing; frequent bending forward of the trunk; continual motion of the hands and fingers; gay delirium, with a vacant smile; aphonia or confused sounds, uttered with pain; probably ineffectual desires of going to stool; gradual restoration to health and reason, without any recollection of the preceding state" (Gualtier de Claubry, in Orfila's *Toxicol. Gén.*)

In comparing the operation of belladonna with that of other cerebro-spinants (narcotics, *auct.*), the most remarkable symptoms which attract our attention are the dilatation of the pupils, with insensibility of the irides to light, disturbance of vision, diminished feeling, giddiness, staggering, the delirium (extravagant, pleasing, or furious), followed by sopor, and the remarkable affection of the mouth and throat (dryness of the throat, difficulty of deglutition and of articulation). Convulsions are rare, and, when they occur, are slight. Lethargy or sopor occurs subsequently to the delirium. Local irritation is not well marked.

These characters distinguish the effects of belladonna from those of any other substance, except henbane (*see* p. 851), stramonium (*see* p. 863), and perhaps from some other solanaceous species.

When applied to the eyebrow, belladonna causes dilatation of the pupil, without necessarily affecting the other eye or disturbing vision. Segalas (*Lancet*, 1826-27, vol. xii. p. 170) has rendered it probable that absorption or imbibition is essential to this effect. But the action on the iris depends, according to Müller (*Physiology*, vol. i. p. 630), not on the operation of the belladonna on the central organs of the nervous system, but on its topical, paralyzing influence on the ciliary nerves. When, however, belladonna is swallowed, it is obvious that the irides can become affected through the general system only, and in this case the dilatation of the pupil is accompanied with disturbance of vision. (For some interesting observations on the associated functions of the retina and iris, consult Grainger's *Observ. on the Struct. and Funct. of the Spinal Cord*, p. 72 and seq.) The pneumogastric nerve is obviously concerned in producing the affection of the mouth and the difficulty of deglutition and articulation.

The disorder of the intellect and of the external senses caused by belladonna proves that the influence of this agent is not limited to the excito-motory system, but is extended to those portions of the nervous centres which are the seat of the intellect and of sensibility.

Uses.—Belladonna has been employed to allay pain and nervous irritation (*erethismus nervosus* of some authors); to diminish the sensibility of the retina to the impression of light; to produce dilatation of the pupil; to counteract that condition of brain which is accompanied with contraction of the pupil; and to lessen rigidity and spasmodic contraction of muscular fibres. These uses obviously arise out of the ascertained physiological effects of the remedy. There are others, however, which may be regarded as altogether empirical: such as its employment to resolve or discuss scirrhous tumors.

The indications and contra-indications for its use are not sufficiently established to induce us to place much confidence in them. My own experience leads me to believe that it is not a remedy fitted for plethoric constitutions, or for febrile and acute inflammatory cases; and I am not disposed to admit the observations of Dr. Graves, hereafter to be mentioned, as offering any valid objections to these statements.

1. *To allay pain and nervous irritation.*—As an anodyne in most internal pains no remedy hitherto proposed is equal to opium; but this agent totally fails us in many of those external pains known as *neuralgia, prosopalgia,* or *tic douloureux.* In such, belladonna occasionally succeeds in abating, sometimes in completely removing, pain; while it totally fails to give relief in the internal pains for which experience has found opium so efficacious. It is remarkable, therefore, that while both these cerebro-spinants (narcotics, *auctor.*) agree in lessening pain, they totally disagree as to the cases in which they succeed, and for which they are individually applicable. In the treatment of neuralgia, belladonna is employed both internally and externally. I believe that, to be successful, it requires, in many cases, to be persevered in until dryness of the throat, dilatation of pupil, and some disorder of vision, are produced. Just as in many diseases for which mercury has been found a most efficient remedy, it is necessary to continue the use of this mineral until the mouth be affected, and often even to use it for some time afterwards. Of the success of belladonna in the treatment of neuralgia, we have abundant evidence in the published cases of Mr. Bailey (*Observ. relat. to the Use of Belladon. in painful Disord. of the Head and Face*, 1818) and of several other practitioners (Bayle, *Bibl. Thérap.* t. ii.) My own experience of the use of this remedy leads me to regard it as very much inferior to aconite as a local remedy for this disease.

Besides neuralgia there are many other painful affections against which belladonna is used as a local anodyne. Such are arthritic pains, painful ulcers, glandular enlargements which are tender to the touch, &c.

2. *As an antispasmodic.*—To relieve rigidity and spasmodic contraction of muscular fibres, belladonna sometimes proves serviceable as a topical remedy. *In rigidity of the os uteri*, during lingering labours or puerperal convulsions, the extract or an ointment of belladonna (see *unguentum belladonnæ*) has been applied to the part by way of friction. Though the practice has been lauded by Chaussier (*Consid. sur les Convuls. qui attaq. les Femmes enceint.*, 2nd ed. 1824), and adopted by Velpeau (*Traité compl. des Accouchem.*), Conquest (*Outlines of Midwifery*), and others, yet it has not found much favour with British practitioners. It cannot be regarded as a substitute for, but only an adjuvant to, depletion; and its use is not devoid of danger: for, not to insist on the possibility of absorption, and the consequent injurious effects therefrom, it is obvious that the long-continued friction of the tender womb, and the removal of the lubricating mucus, may dispose to

inflammation. *In spasmodic stricture of the urethra, and of the sphincters of the bladder and rectum, and in spasmodic contraction of the uterus,* the topical use of the extract (smeared on a bougie, applied to the perineum or other parts, or employed by way of a clyster) has in some cases appeared to give relief (*Brit. and For. Med. Rev.* vol. ii. p. 261). *In strangulated hernia* it has been employed to produce relaxation of the abdominal muscles (Van Looth, Köhler, and Pages, quoted by Bayle, *Bibl. Thérap.* t. ii., and *Brit. and For. Med. Rev.* vol. ii. p. 262-3).

In a case of angina pectoris, unconnected with organic disease, the application of a belladonna plaster to the chest (before the ulcerations caused by tartar emetic ointment had healed) produced alarming signs of poisoning; but when these had subsided, all symptoms of the angina had totally disappeared (Davies, *Lect. on Diseases of the Lungs and Heart*, p. 496).

Considerable relief has been gained in several cases of *hooping-cough* by the use of belladonna (see the observations of Schaeffer and Wetzler, of Meglin, and of Raisin, quoted by Bayle, *Bibl. Thér.* t. ii.) Its occasional efficacy depends in part, probably, on its lessening the necessity of respiration (Laennec, *Treat. on Dis. of the Chest*, by Forbes, pp. 77 and 99), as well also on its power of obviating spasm of the bronchial tubes, and of decreasing the susceptibility of the bronchial membrane to the influence of the exciting causes of the paroxysms. But like all other vaunted specifics for this peculiar disease, it frequently fails to give the least relief.

3. *In Maladies of the Eyes.*—Belladonna is applied to the eye for two purposes: the first, and the most common, is to dilate the pupil; the other is to diminish the preternatural sensibility of the retina to the impression of light. *Dilatation of the pupil* is sometimes produced, in certain diseases of the eye, in order to enable us to examine the condition of the refractive humours, and thereby to ascertain the nature and extent of the malady; as in cases of incipient cataract, which might otherwise be occasionally confounded with glaucoma or amaurosis. In the operation of cataract by solution or absorption (*keratonyxis*), the full dilatation of the pupil by belladonna is essential (Lawrence, *Lect.* in *Lancet*, for Sept. 9. 1826). In *iritis*, dilatation of the pupil is important, in order to prevent, or in recent cases to rupture, adhesions of the uvea to the capsule of the crystalline lens. Some surgeons consider it an objectionable remedy during the early stage of the disease. In *prolapsus iridis* benefit is, under some circumstances, gained by the use of belladonna; as, where there is opacity of the cornea covering the pupil, the dilatation of the aperture, so as to get its circumference beyond the opaque spot, is attended with an improvement of vision. These are some of the cases in which dilatation of the pupil by belladonna is advisable. It is usually effected by applying the extract (see *extractum belladonnæ*) to the parts around the eye, or to the conjunctiva. The dilatation usually takes place within a few minutes, and sometimes continues for twenty-four hours.

Belladonna is sometimes employed in inflammatory and other affections of the eye, to diminish the morbid sensibility of this organ to the influence of light (Lisfranc, *Rev. Méd.* t. i. 1826, p. 17; and t. ii. p. 384).

4. *As a resolvent or discutient.*—In enlargement and induration of the lymphatic glands, in scirrhus and cancer (or diseases which have been

supposed to be such), belladonna has gained no slight repute from its supposed resolvent or discutient properties. That it may give relief by its anodyne powers we can easily understand, but that it has any real resolvent or discutient properties in the diseases just enumerated, may be reasonably doubted, notwithstanding the favourable reports of Gataker (*Observ. on the intern. Use of the Solanum*, 1757), Cullen (*Mat. Med.*), Blackett (*Essay on the Use of Atropa Belladonna*, 1826), and others (see Bayle, *Bibl. Thér.* t. ii.) Bromfield (*Account of the English Nightshades*, 1757) and others have reported unfavourably of it, and no one, I think, now places any reliance on it.

5. *As a prophylactic against Scarlatina.*—The introduction of belladonna into practice as a preventive of scarlet fever, is owing to the absurd homœopathic axiom of "*similia similibus curantur:*" for as this plant gives rise to an affection of the throat, and sometimes to a scarlet rash on the skin, its power of guarding the system against the reception of scarlet fever has been assumed; and the assumption has been endeavoured to be established by an appeal to experience. Bayle (*Bibl. Thérap.* t. ii. p. 504) has collected from various publications 2,027 cases of persons who took this medicine, and were exposed to the contagion; of these 1948 escaped. Oppenheim (*Lond. Med. Gaz.* vol. xiii. p. 814) gave it to 1200 soldiers, and only 12 became affected. To the authorities here referred to may be added Hufeland (*Lancet*, May 2, 1829) and Koreff (*Lond. Med. Gaz.* vol. iv. p. 297), who admit, from their own personal observations, the efficacy of the remedy, though they have not specified the number of cases in which they have tried it. But bearing in mind the well-known capriciousness evinced by scarlet fever (as indeed by other contagious disorders) in regard to the subjects of its attacks, and the large number of those who, though exposed to its influence, escape, the best evidence hitherto adduced in favour of the notion must be admitted to be inconclusive. While, therefore, the facts brought forward in favour of the existence of this prophylactic power are only negative, those which can be adduced against it are positive. For I conceive twenty cases of failure are more conclusive against the opinion here referred to, than one thousand of non-occurrence are in favour of it. Now Lehman (Bayle, *Bibl. Thérap.* t. ii. p. 417), Barth (*Ibid.*), Wendt (Rust and Casper's *Krit. Repert.* Bd. xxii. S. 27), Muhrbeck (Rust's *Magaz.* Bd. xxiv. S. 495), Hoffmann (*Ibid.* Bd. xxv. S. 115), Bock (*Ibid.* S. 580), and many others that I could refer to, declare it has failed in their hands to evince its prophylactic powers. In this country we have no extended series of observations to quote; but the cases which I am acquainted with are decidedly against the efficacy of the remedy. A remarkable failure is mentioned by Dr. Sigmond (*Lancet*, 1836-7, vol. ii. p. 78) of a family of eleven persons who took the supposed specific, yet every individual contracted the disease.

6. *In Fever, with contraction of the pupil.*—Dr. Graves (*Dubl. Journ. of Med. Science*, July 1, 1838) has recently proposed the use of belladonna in those cases of fever with cerebral disease which are attended with contraction of the pupil. It is not unreasonable, he observes, "to suppose that the state of the brain which accompanies dilatation of the pupil is different from that which accompanies contraction; and if belladonna has an effect in producing that cerebral state which is attended with dilatation, it is not going too far to infer, that its adminis-

tration may do much towards counteracting the opposite condition; neither is it unphysiological to conclude, that if a remedy be capable of counteracting, or preventing, one very remarkable effect of a certain morbid state of the brain, it may also counteract other symptoms connected with the same condition." This line of argument, it must be admitted, is ingenious and plausible, and is supported by reference to several apparently successful cases treated on the principles here laid down. But I would observe, if the above reasoning were valid, opium should be serviceable in cerebral diseases attended with dilatation of pupil, since it causes contraction of this aperture. Now this is in direct opposition to our every-day experience of the uses of this important narcotic.

7. *In other diseases.*—Cruveilhier (*Lancet*, 1828-9, vol. i. p. 520) has found belladonna-smoking relieve some cases of *phthisis*. The fresh leaves were infused in a strong solution of opium, and then dried like tobacco: the patients began by smoking two pipes a day, and the quantity was gradually increased to six pipes. Perhaps this practice would be beneficial in spasmodic asthma and old catarrhs. In *hydrophobia*, notwithstanding the asserted prophylactic powers of this medicine (see the authorities quoted by Bayle, *Bibl. Thér.* t. ii.; and Richter, *Ausf. Arzneim.* Bd. ii.), there is no valid ground for believing in its efficacy. I tried it in one case without success. In *epilepsy*, *mania*, *hysteria*, *chorea*, and some other maladies of the centro-spinal system, occasional benefit has resulted by the use of belladonna. In *ileus* it has been most successfully used in the form of clyster, as a substitute for tobacco, which is objectionable on account of the horrible sickness and great depression (*Brit. and For. Med. Rev.* vol. iv. p. 223).

Administration.—The dose of the *powder* for an adult is one grain, which should be gradually increased until dryness of the throat, dilatation of pupil, or some head symptoms are produced. For children the dose at the commencement should be one-eighth of a grain. For internal as well as external use the *extract* or *tincture* is, however, commonly employed. For external use an *infusion* of the leaves is sometimes used as a fomentation, or is made into a poultice with bread or linseed meal.

1. *Extractum Belladonnæ*, L. E.; *Succus spissatus Belladonnæ*, D.—(Fresh Belladonna leaves, lb. i. Bruise them, sprinkled with a little water, in a stone mortar; then press out the juice, and evaporate it, unstrained, to a proper consistence, *L.*—The *Edinburgh College* directs the expressed juice to be filtered, and then to be evaporated, in the vapour-bath, to the consistence of firm extract, stirring constantly towards the close.—The *Dublin College* prepares it as the *Succus spissatus Aconiti*, D.) 1 cwt. of fresh belladonna yields from 4 to 6 lbs. of extract (Brande, *Man. of Pharm.* 3d ed. p. 401). Dose gr. i. to gr. v. cautiously increased. As the strength of the extract is extremely variable, some writers recommend only one-quarter or one-half of a grain to be given at the commencement of its use, and to be repeated three times a day; and the dose to be increased until the well-known effects of the remedy are produced. Mr. Bailey observes, that he at first began with one grain, and repeated it every four hours until relief followed; but further experience induced him to commence with three times that quantity, and, if a repetition were necessary, to give it in diminished doses afterwards. Spread upon leather the extract is frequently used as a plaster to relieve

neuralgic and other pains (see *Emplastrum Belladonnæ*). Diluted with water to the consistence of cream, it is applied to the eyebrow to produce dilatation of the pupil; or an aqueous solution of the extract is dropped between the lids. Mixed with lard or spermaceti ointment it is used as a topical anodyne and antispasmodic in various diseases (see *Unguentum Belladonnæ*). A bougie smeared over with the extract and oil, is sometimes used with benefit in stricture (*Lond. Med. Gaz.* vol. v. p. 735). A drachm or two of the extract, either alone or in the form of ointment, may be applied to the os uteri to diminish rigidity. In irritation of the bladder, urinary organs, or rectum, clysters holding in solution the extract are sometimes used. Rubbed into the perineum or over the tract of the urethra, the extract or ointment is useful in preventing chordee, and alleviating spasm of the neck of the bladder.

2. *Emplastrum Belladonnæ*, L. E. D.—(Extract of belladonna, ℥iss. [℥j. *D.*]; Plaster of Resin, ℥iij. [Soap Plaster, ℥ij. *D.*] Add the extract to the plaster, melted by the heat of a water-bath, and mix). Anodyne and antispasmodic. Applied for the relief of neuralgic, rheumatic, and other pains. It is said to relieve the pain of dysmenorrhœa when applied to the sacrum. In spreading it, care must be taken not to employ a very hot spatula, or the properties of the extract will be injured.

3. *Unguentum Belladonnæ*.—(Spermaceti Ointment [or Lard] ℥j.; Extract of Belladonna, ʒj. to ʒij. Mix). Though not contained in any of the British pharmacopœias, it is a very useful preparation; and may be used as an anodyne and antispasmodic in some of the before-mentioned cases.

4. *Tinctura Belladonnæ*.—(Belladonna leaves, dried, ℥ij.; Proof Spirit, f℥xvj. Macerate for twenty [fourteen] days, and strain. *Bailey.*) Is not contained in the British pharmacopœias. Mr. Bailey's formula here given contains the same proportions of leaves and spirit as those used in the preparation of *Tinctura Hyoscyami*, L. Dose, ♏xx. to ♏xl. Mr. Blackett (*Lond. Med. Rep.* vol. xix. p. 458) prepared a *saturated tincture of belladonna* by macerating, for fourteen days, ʒx. of extract of belladonna in lb. j. of proof spirit; then straining. The dose of this is ♏ij. or ♏iij. gradually increased: in the form of lotion, a drachm of it was added to eight ounces of liquid.

Antidotes.—Similar to those for opium. After the use of evacuants the vegetable acids have appeared to give great relief. Decoction of nutgalls or green tea might probably prove serviceable.

Datu'ra Stramo'nium, L. E. D.—*Common Thornapple.*

Sex. Syst. Pentandria, Monogynia.

(Folia et Semina, *L.*—Herb, *E.*—Herba et Semina, *D.*)

History.—Some writers consider this plant to be the στρύχνον μανικὸν of Dioscorides (lib. iv. cap. 74),—an opinion scarcely tenable, as this ancient pharmacologist describes his plant as having a black flower and black fruit. Datura Stramonium is mentioned by Fuchsius in 1542 (Sprengel, *Hist. Rei Herb.* t. ii. p. 326).

Botany. Gen. Char.—*Calyx* large, tubular, ventricose, five-angled; apex five-cleft, caducous; base orbiculate, peltate, persistent. *Corolla* large, funnel-shaped; tube long; limb five-angled, five-plicate, five-acuminate. *Stamens* five. *Stigma* two-lamellar. *Capsule* bristly or smooth, ovate, two-celled; cells two- or many-parted with a prominent dissepiment (*Bot. Gall.*)

Sp. Char.—*Fruit* spinous, ovate, erect. *Leaves* ovate, smooth, sinuated. (Smith.)

A bushy, smooth, fetid *herb*. *Stem* much branched, forked, spreading, leafy. *Leaves* from the forks of the stem, large, unequal at the base, variously and acutely sinuated and toothed, simple-ribbed, veiny, of a dull-green. *Flowers* axillary, erect, white, sweet-scented, especially at night, about three inches long. *Fruit* as big as a walnut, in its outer coat very prickly. *Seeds* black. (Smith.)

Hab.—Indigenous: in waste ground and on dunghills. Annual. Flowers in July.

Description.—The herb (*herba stramonii*) should be collected when the plant is in flower. The leaves (*folia stramonii*) are then to be carefully dried. In the fresh state their odour, when bruised, is unpleasant and narcotic; their taste nauseous and bitter. By drying the odour is lost, but the bitter taste remains. The seeds (*semina stramonii*) are small, compressed, kidney-shaped, roughish, dark-brown or blackish, dull, and odourless: they have a bitter, nauseous, somewhat acrid taste.

Composition.—The herb was analyzed, in 1815, by Promnitz (Gmelin's *Handb. d. Chem.* Bd. ii. S. 1305); the seeds, in 1820, by Brandes (*Ibid.*)

Promnitz's Analysis.

Resin	0·12
Extractive [containing the Daturia ?]	0·60
Gummy extractive	0·58
Green fecula	0·64
Albumen	0·15
Phosphatic and vegetable salts of lime and magnesia	0·23
Water	91·25
Woody fibre	5·15
Loss	1·28
Fresh herb of Stramonium	100·00

Brandes's Analysis.

Malate of daturia with some uncrystallizable sugar	1·80
Fixed oil with some chlorophylle	16·05
Wax	1·40
Resin insoluble in ether	9·90
Extractive	0·60
Gummy extractive	6·00
Gum and bassorin with some salts	11·30
Albumen and phytocolla	6·45
Glutenoin	5·50
Malates of daturia, potash, and lime, and acetate of potash	0.60
Woody fibre	23.35
Water	15·10
Loss	1·95
Seeds of Stramonium	100·00

1. *Daturia* (*Daturina* or *Daturium*).—A vegetable alkali said to exist in stramonium. The properties assigned to it by Geiger and Hesse (*Pharm. Central-Blatt für* 1835, p. 85) are the following:—It crystallizes in colourless, odourless, brilliant prisms, which have at first a bitterish, then a tobacco-like flavour. It requires 280 parts of cold, or 72 parts of boiling water, to dissolve it: it is very soluble in alcohol, less so in ether. In most of its properties it agrees with hyoscyamia. It strongly dilates the pupil, and has a poisonous action on animals.

2. *Empyreumatic oil of Stramonium* (*Pyrodaturia ?*).—Resembles tar and the aqueous fluid which distils along with its acid. This arises from the woody part of the plant having been employed. The oil itself does not differ, in its physical and chemical properties, from the empyreumatic oil of foxglove, before (p. 838) described (Morries, *Ed. Med.* and *Surg. Journ.* vol. 39, p. 379.)

Physiological Effects. (*a.*) *On vegetables.*—A branch of stramonium was killed by immersing it in a watery solution of the extract of its own species (Macaire, quoted by Decandolle, *Phys. Vég.* p. 1354).

(*b.*) *On animals generally.*—Its influence on herbivorous animals is much less than on man. Five ounces of the expressed juice given to the horse causes merely slight drowsiness and gaping (Moiroud, *Pharm. Vét.* p. 350). Two pounds and a half of the seeds killed a horse in 52 hours (Viborg, in Wibmer's *Wirk. d. Arzneim. ü. Gifte.* B. ii. S. 292). From Orfila's experiments with it on dogs (*Toxicol. Gén.*) it does not appear to act powerfully as a local irritant. Its effects were very similar to those caused by belladonna.

(*c.*) *On man.*—The symptoms produced on man closely resemble those caused by belladonna. *In small but gradually increased doses* it diminishes sensibility, and thereby frequently alleviates pain. It does not usually affect the pulse; it slightly and temporarily dilates the pupil, and has no tendency to cause constipation, but rather relaxation. Though it allays pain it does not usually produce sleep. *In larger doses* it causes thirst, dryness of the throat, nausea, giddiness, nervous agitation, dilatation of pupil, obscurity of vision, headache, disturbance of the cerebral functions, perspiration, occasionally relaxation of bowels, and in some cases diuresis. It has no direct tendency to induce sleep, and hence it cannot be called *soporific*. But indirectly, by alleviating pain, and thereby producing serenity and ease, it often disposes to sleep. *In fatal doses* the leading symptoms are flushed countenance, delirium (usually maniacal), dilatation of the pupil, dryness of the throat, loss of voice, difficulty of deglutition, convulsions, and, in some cases, palsy. A very interesting fatal case of poisoning by 100 seeds, is related by Mr. Duffin (*Lond. Med. Gaz.* vol. xv. p. 194). The patient (his own child) was two years and a quarter old. In addition to the preceding symptoms there were a hot, perspiring skin, flushed, slightly swollen face, pulse imperceptible, but natural in regard to frequency, and coldness of the inferior extremities. The anterior fontanelle was neither tense, hot, nor in the slightest degree raised by the cerebral pulsations; so that there did not seem to be any active determination of blood to the brain. During the continuance of the coma the pulse became extremely rapid. Death occurred twenty-four hours after swallowing the seeds.

Vogt (*Pharmakodyn.* Bd. i. S. 164) says, stramonium is probably distinguished from belladonna by the following peculiarities:—

1. Its effects are more similar to those of acrid vegetables, especially of *Helleborus*.
2. It operates more strongly, but more in the manner of the acrid substances, on the nervous system, especially on the central organs, viz. the ganglia, spinal cord, and brain.
3. Its secondary effects on the irritable system are not so marked; for most observers have failed to detect any alteration of pulse, and a slow pulse is more frequently mentioned than a quick one.
4. It operates on the organic life more strongly. It more strongly and directly promotes all the secretions, especially the secretion of the skin.
5. Marcet (*Med.-Chir. Trans.* vols. vii. and viii.) and Begbie (*Trans. of the Med. Soc. Edinb.* t. i.) have inferred, from numerous observations, that it possesses an anodyne property, which it frequently evinces where opium and belladonna fail to do so.

Uses.—A more extended experience of this plant is requisite to enable us to speak with much confidence of its employment. The similarity of its effects with those of belladonna would lead us to expect a similarity of uses. Like the last-mentioned plant it has been successfully employed to diminish sensibility, and thereby to relieve external pain. Some of the other uses made of it require a more impartial examination ere we can form any just estimate of their value. The indications and contra-indications for its employment are probably similar to those of belladonna. In persons disposed to apoplexy it is a very dangerous remedy.

In *neuralgia* (*tic douloureux, sciatica, &c.*) it has been employed with considerable success, by Lentin (Bayle, *Bibl. Thér.* t. ii.), Marcet (*Med.-Chir. Trans.* vols. vii. and viiii.), and Begbie (*Trans. Med.-Chir. Soc. of Edinb.* vol. i.) It was given internally in the form of extract. Its external application has scarcely been tried. In *rheumatism* it has frequently proved serviceable from its anodyne qualities (see the reports of Kirckhoff, Engelhart, Van-Nuffal, and Amelung, in Bayle, *op. cit.*; also Eberle, *Mat. Med.*) In *enterodynia* (that is, spasmodic pain of the bowels unconnected with inflammatory action or the presence of irritating substances), Dr. Elliotson (*Lancet*, 1826-7, vol. xii.; and 1827-8, vol. ii.) found it most successful.

In some cases of *spasmodic asthma*, smoking the herb has given at least temporary relief (English, in *Ed. Med. and Surg. Journ.* vol. vii.; and Dr. Sims, *Ibid.* vol. viii.): but the practice requires very great caution, as it has on some occasions proved highly injurious, and in some instances fatal. Dr. Bree (*Lond. Med. and Phys. Journ.* vol. xxvi. p. 51) tried it in 82 asthmatic cases: in 58 of these it had no permanent good effect, and in the remaining 24 it acted injuriously. General Gent, who was instrumental in introducing the practice, fell a victim to it (*Ibid.* p. 49). Aggravation of the dyspnœa, paralytic tremblings, epilepsy, headache, and apoplexy, are some of the evils said to have been induced in the cases above referred to. In persons disposed to head affections, and in aged persons, it is therefore a highly dangerous practice.

The diseases in which stramonium has been principally used are *mania* and *epilepsy*. Bayle (*Bibl. Thérap.* t. ii.) has collected from the works of Storck, Schemalz, Razoux, Reef, Meyer, Odhelius, Durande, Maret, Bergius, Greding, Schneider, Bernard, and Amelung, fifty-five cases of the first, and forty-five of the latter malady, treated by stramonium: in both diseases a considerable majority of cases are said to have been either cured or relieved by it. Without denying the occasional benefit of stramonium in these diseases, I believe the cases in which it is serviceable to be very rare, while those in which it is calculated to be injurious are very common. Dr. Cullen (*Mat. Med.*) observes, that he has no doubt that narcotics may be a remedy for certain cases of mania and epilepsy; but he very justly adds, "I have not, and I doubt if any other person has, learned to distinguish the cases to which such remedies are properly adapted."

Stramonium has been used *to dilate the pupil* and *to diminish the sensibility of the retina to the influence of light;* but for both of these purposes belladonna is preferred by British oculists. Wendt (Rust's *Magaz.* Bd. xxiv. S. 302) used it *to lessen venereal excitement*, as in nymphomania. An ointment (made with ℥j. of the powdered leaves, and ℥iv. of lard) has been used as an anodyne application to *irritable ulcers* and to *painful hemorrhoids.* The application of the leaves to *burns* has been attended with dangerous results (*Journ. de Chim. Méd.* t. vi. p. 722).

Administration.—The dose of the powdered *leaves* is one grain; of the *seeds* half a grain. These doses are to be repeated twice or thrice a-day, and to be gradually increased until some obvious effect is produced.

1. *Extractum Stramonii*, L. E. D. — (Thornapple seeds, ℥xv. [℔j. *D.*]; Boiling distilled water, *Cong.* j. Macerate for four hours in a vessel lightly covered, near the fire; afterwards take out the seeds, and bruise them in a stone mortar: return them, when bruised, to the liquor. Then boil down to four pints, and strain the liquor while hot. Lastly, evaporate to a proper consistence, *L.* and *D.*—The directions of the *Edinburgh College* are as follows:—Take the seeds of stramonium, any convenient quantity; grind them well in a coffee-mill. Rub the powder into a thick mass with proof spirit; put the pulp into a percolator, and transmit proof spirit till it passes colourless; distil off the spirit, and evaporate what remains in the vapour-bath to a proper consistence).

Of the above modes of preparation, that of the Edinburgh College is doubtless the best, as yielding a more efficient preparation. The product, according to the London and Dublin process, is about 12 per cent. (Barker, *Observ. on the Dub. Pharm.*) Recluz (*United States Dispensat.*) states, that 16 ozs. of the seeds yield 2 ozs. 2 drs. by maceration in dilute alcohol: this is about 14 per cent. The dose of extract of stramonium, at the commencement, is about a quarter of a grain, which should be gradually increased until some obvious effect is produced.

2. *Tinctura Stramonii*, Ph. United States. — (Stramonium seeds, bruised, ℥iv.; Proof Spirit, ℥xxxij. Macerate for fourteen days, and filter through paper). Dose ♏x. to ♏xx. twice or thrice a day, gradually increased until it occasions some obvious effect on the system. This preparation is applicable to all the cases for which stramonium is used.

Antidotes.—The same as for belladonna.

Nicotia'na Taba'cum, L. E. D.—*Virginian Tobac'co.*

Sex. Syst. Pentandria, Monogynia.

(Folia exsiccata, *L.*—Leaves, *E.*—Folia, *D.*)

History.—The inhalation of the fumes of burning vegetable sub stances, both for causing inebriation or for medicinal purposes, seems to have been very anciently practised. Herodotus (*Clio*, ccii.) tells us, that the Babylonians intoxicated themselves by this means; and both Dioscorides (lib. ii. cap. 126) and Pliny (*Hist. Nat.* lib. xxvi. cap. 16, ed. Valp.) declare the efficacy of smoking Tussilago in obstinate cough.

Humboldt (*Personal Narrative*, vol. v. p. 666) says, that the tobacco plant has been cultivated, from time immemorial, by the natives of Oronoko. It does not appear, however, to have been known to Europeans prior to the discovery of America; though it is not improbable that the Asiatics were acquainted with it long before that time, as Pallas, Rumphius, and Loureiro, have supposed. But it is not probable, I think, that Europeans learned the use of it from the Asiatics, as Ulloa has endeavoured to show.

When Columbus and his followers arrived at Cuba, in 1492, they, for the first time, beheld the custom of smoking cigars (W. Irving, *Hist. of the Life and Voyages of Columbus*, vol. i. p. 287; also the narrative of Don Fernando Colon, son-in-law of Columbus, *Hist. del Amir.* cap. 27, in Barcia, *Hist. prim. de las Indias occid.* vol. i. p. 24). Hernandez de Toledo introduced the plant into Spain and Portugal; and, from the latter place, Jean Nicot sent the seeds or the plant to France, about

1559-60 (Bauhin's *Pinax*). In 1586, on the return of Sir Francis Drake, with the colonists, from Virginia, the practice of smoking was introduced into England; and, being adopted by Sir Walter Raleigh and other courtiers, soon became common (*Biograph. Brit.* vol. v. p. 3471; and Clusius, *Exotic.* p. 310).

Various attempts, by writings, imposts, or bodily punishments, were made in Europe to restrict or put down its use (Adam Clarke, *Dissert. on the Use and Abuse of Tobacco*, 1797; *Med. and Phys. Journ.* vol. xxiv. p. 451; and C. C. Antz, *Tabaci Hist. Diss. Inaug.* Berol. 1836). It is said, that upwards of a hundred volumes were written to condemn its use; and not the least curious of these is the celebrated "*Counter-blaste to Tobacco*" of James I. (*Works*, p. 214, fol. 1616). Despite, and partly, perhaps, as a consequence of these attempts, the use of tobacco rapidly spread, and is now universal throughout the world (*Asiat. Journ.* vol. xxii.)

The generic appellation Nicotiana is obviously derived from Nicot, the name of an individual above referred to. The origin of the specific name Tabacum is less satisfactorily ascertained. It is probable, however, that the word is derived from *tabac*, an instrument used by the natives of America in smoking this herb; though some derive it from the *Tobago*, others from *Tabasco*, a town in New Spain.

BOTANY. *Gen. Char.*—*Calyx* urceolate, five-cleft. *Corolla* much longer than the calyx, funnel-shaped, five-cleft, regular. *Stamens* five. *Stigma* emarginate. *Capsule* two-valved (*Bot. Gall.*)

FIG. 179.

Nicotiana Tabacum.

Sp. Char.—*Leaves* sessile, oblong-lanceolate, acuminate, the lower ones decurrent. Throat of the *corolla* inflate-ventricose; limb with acuminated segments (*Bot. Gall.*)

A viscid *herb*. *Root* branching, fibrous. *Stem* three to six feet high, erect, round, hairy, branching at the top. *Leaves* very large, pale green, with glandular short hairs. *Bracts* linear, acute. *Flowers* panicled on the end of the stem and branches. *Calyx* hairy. *Corolla* rose-coloured. *Ovarium* ovate; *style* long and slender; *stigma* capitate, cloven. *Capsule* two-celled, opening cross-wise at the top, loculicidal. *Seeds* numerous, small, somewhat reniform, brown.

Hab.—America. Extensively cultivated in most parts of the world, especially the United States of America. Virginia is the most celebrated for its culture. North of Maryland the plant is rarely seen (*United States Dispensatory*). In England the cultivation is restricted; not more than half a pole being allowed "in a physic or university garden, or in any private garden for physic or chirurgery" (Loudon's *Encyclopædia of Agriculture*).

Nicotiana rustica, Common Green Tobacco, is cultivated in several parts of the world. It yields a milder tobacco, and is said to have been

FIG. 180.

Nicotiana rustica.

preferred by Sir W. Raleigh. *Syrian* and *Turkish tobaccos* are prepared from it (Royle, *Illust.* p. 283; Lindley, *Fl. Med.*)

Nicotiana repanda is said to yield the small Havannah cigars (Royle.)

Nicotiana persica yields the delicate and fragrant *tobacco of Shiraz* (Lindley).

CULTURE.—In Virginia and Maryland the seeds are thickly sown in beds of finely-prepared earth. When the young plants have five or six leaves, exclusive of the seminal leaves, they are transplanted into fields during the month of May, and set three or four feet apart, in rows. During the whole period of growth the crop requires constant attention; and to promote the development of leaves, the tops are pinched off, by which the formation of flowers and seed is prevented. The harvest is in August. The ripe plants are cut off above their roots, dried under cover, stripped of their leaves, tied in bundles, packed in hogsheads, &c. (Loudon's *Encycl. of Agricult.*; Carver, *Treat. on the Cult. of the Tobacco Plant*, 1779).

COMMERCE.—The duty on tobacco, the produce of British possessions in America, is 2s. 9d. per lb.; of other parts, 3s.—on snuff, 6s. per lb.—on cigars, and other kinds of manufactured tobacco, 9s. These exorbitant duties lead to extensive smuggling. In 1839, 124,637 cwts. of tobacco, and 176,422 lbs. of cigars paid duty.

DESCRIPTION.—Tobacco (*folia tabaci* seu *nicotianæ*) is met with in commerce, has a brownish colour, a strong narcotic but peculiar odour, and a bitter, nauseous taste. The darker-coloured tobaccos are the strongest. The following are the principal commercial kinds:—

1. AMERICAN. (*a.*) *NORTH AMERICAN.*—The *Virginian* is one of the strongest kinds, and is, therefore, not fit for cigars, but is adapted for pipes and snuff, and for medicinal use. Its colour is deep brown; the leaves feel unctuous. The *Maryland* is paler, yellower, weaker, and adapted for smoking: the *pale cinnamon* is the best, the *scrubs* the commonest. The *Kentucky* is intermediate between the two preceding. The *Carolina* is less frequently met with.

(*b.*) *SOUTH ARMEICAN.*—The *Havannah* is most esteemed for smoking: its colour is yellowish-brown: its odour is musky or spicy. It is imported in heads. The *Cuba* is an excellent kind. Both these kinds are remarkable for the light yellow spots on the leaves. The *Columbian* is imported in heads and leaves, and is much esteemed for cigars. The *Varinas* is brought over in rolls, the *Orinoko* in leaves, the *Porto Rico* in rolls, the *St. Domingo* in leaves.

2. EUROPEAN.—The only European tobacco extensively consumed in this country is the *Amersfoort*, a Dutch tobacco. Several *German*, *Hungarian*, and *Ukraine* tobaccos are occasionally met with (Sinsheim, *Die Rauch. u. Schnupftabaks-Fabrikation*, 1826).

3. ASIATIC.—*East Indian* tobacco has never obtained a high repute, doubtless from the inattention to its cultivation (Royle, *Illustrations*, p. 285). The *Manilla* is dark-coloured, and is much esteemed. The *Shiraz*, the *Salonica* (the ancient Thessalonica), the *Latakkia* (Laodicea), are other valued Asiatic kinds. *Turkey* tobacco is pale and yellowish.

MANUFACTURED TOBACCO (*Chewing and Smoking Tobaccos and Snuffs*).—*Shag* is prepared by moistening and compressing tobacco, and then cutting it with knife-edged chopping-stamps. *Returns* is another variety of smoking tobacco. *Kanaster* is a favourite kind, prepared from

Havannah tobacco: it received its name from *canastra* (a Spanish word signifying *a basket*), because it was sold in baskets. The term is now also applied to tobacco from *Varinas*. *Pigtail* and *Negro-head* are chewing tobaccos. *Cigars* and *Sheroots* (the latter distinguished by their truncated extremities, while cigars have a pointed extremity called the *curl*, or *twist*) are extensively manufactured in London. *Woodville's Havannah cigars* and *Manilla sheroots* are in request by smokers.

In the manufacture of *snuff*, the tobacco is first fermented by placing it in heaps, and sprinkling it with water. It soon becomes hot, and evolves ammonia. The extent to which this process is allowed to proceed varies with different kinds of snuff. The immense varieties of snuffs found in the shops are reducible to two kinds:—1st. *Dry snuffs*, including the *Scotch*, *Irish*, *Welsh*, and the scarce *Spanish*. 2nd. *Moist snuffs* or *rappees*, under which are included *simple rappees*, (as the *brown*, the *black*, the *Cuba*, the *Carotte*, the *Bolangero*, &c.,) *mixed rappees*, (as *Hardham's Genuine No.* 37), and the *scented rappees*, (as *Prince's mixture*, *Princeza*, &c.) The Scotch and Irish are prepared, for the most part, from the midribs: the Strasburgh, French, and Russian snuffs from the soft part of the leaves. The rappees are usually kept moist by pearlash. Sal ammoniac is frequently added to snuffs. The siftings, sometimes termed *thirds*, are usually reground.

Tobacconists employ, in the preparation of tobacco, a solution of sea-salt, sp. gr. 1·107: this is termed the *sauce* or *liquor*. In the preparation of the *Macouba* snuff of Martinique, molasses, or a solution of extract of liquorice, is added to the salt sauce, by which this snuff acquires a violet colour (Ure, *Dict. of Arts and Manuf.* p. 1255).

Composition.—The juice of the fresh leaves of tobacco was analysed in 1809 by Vauquelin (*Ann. de Chim.* lxxi. 139). Subsequently this chemist analysed manufactured tobacco (*Annal. du Mus. d'Hist. Nat.* t. xiv. p. 21.) In 1821 Hermbstädt (Schweigger's *Journ. für Chem.* xxxi. 442) discovered *nicotianin*. In 1827 the leaves were analyzed by Posselt and Reinmann (Gmelin, *Handb. d. Chem.* ii. 1303), and in 1831 by Dr. Conwell (*Silliman's Journ.* xvii. 369).

Vauquelin's Analysis.

An acrid volatile principle (*nicotina*).
Albumen.
Red matter, soluble in alcohol and water.
Acetic acid.
Supermalate of lime.
Chlorophylle.
Nitrate of potash and chloride of potassium.
Sal ammoniac.
Water.

Expressed juice of the leaves.

The *leaves* contained, in addition to the above, *woody fibre*, *oxalate* and *phosphate of lime*, *oxide of iron*, and *silica*. The two latter substances were obtained from the ashes.

Manufactured tobacco contained the same principles; and, in addition, *carbonate of ammonia* and *chloride of calcium*, doubtless produced by the reaction of sal ammoniac and lime, which are added to tobacco to give it pungency.

Posselt and Reinmann's Analysis.

Nicotina	0·06
Concrete volatile oil (*nicotianin*)	0·01
Bitter extractive	2·87
Gum with malate of lime	1·74
Chlorophylle	0·267
Albumen and gluten	1·308
Malic acid	0·51
Lignin and a trace of starch	4·969
Salts (sulphate, nitrate, and malate of potash, chloride of potassium, phosphate and malate of lime, and malate of ammonia)	0·734
Silica	0·088
Water	88·280
Fresh leaves of tobacco	100·836

1. *Nicotina* (*Nicotin*).—Exists not only in the leaves, but also in the root (E. Davy, *Lond. and Ed. Phil. Mag.* vol. vii. p. 393) and in the seeds (Buchner, *Repert.* Bd. xxxii.) of tobacco. It is obtained by infusing the leaves in water acidulated with sulphuric acid, concentrating the infusion, and distilling with lime or magnesia. The distilled product is a solution of ammonia and nicotina, and is to be saturated with sulphuric acid, and evaporated to dryness: the sulphate of nicotina is then to be dissolved out by ether, and decomposed by hydrate of baryta. The nicotina is obtained by spontaneous evaporation. To obtain it pure, it should be distilled by an oil-bath at the temperature of 288° F. The following are its leading properties:—It is a colourless, liquid, volatile alkali, with the odour of tobacco, and an acrid, burning taste. It restores the blue colour of reddened litmus, and renders turmeric brown. At 375° F. it boils, and at the same time undergoes decomposition. By exposure to the air it becomes brown and thick. It is readily combustible with the aid of a wick. It is soluble in water, ether, alcohol, and the oils (fixed and volatile). It combines with acids and forms salts: the *sulphate*, *phosphate*, *oxalate*, and *tartrate*, are crystallizable; the *acetate* is not. Its atomic weight is about 210. The acetate of nicotina yields a white flocculent precipitate with a solution of bichloride of mercury, and a yellow granular precipitate with chloride of platinum. The precipitates (which are double salts) lead to a suspicion that ammonia was present in the nicotina salt. Heated with water the yellow precipitate obtained by chloride of platinum is converted into the platinum-bichloride of ammonium (Gail, *Pharm. Central-Blatt für* 1836, S. 499). Mr. E. Davy found that nicotina acted as a narcotic poison on insects. The following are the quantities of nicotina yielded by 1000 parts of various kinds of tobacco (Thomson, *Org. Chem.* p. 286): —*Cuba*, 8·64; *Maryland*, 5·28; *Virginia*, 10·00; *Ile de Vilain*, 11·20; *Lot*, 6·48; *North*, 11·28; *Lot et Garonn*, 8·20; for *smoking*, 3·86.

2. *Concrete Volatile Oil of Tobacco* (*Nicotianin*, Hermbstädt; *Tobacco-camphor*, Gmelin).—Obtained by submitting tobacco leaves, with water, to distillation. Six pounds of the leaves yielded 11 grains of oil, which swims on the surface of the liquor. This oil is solid, has the odour of tobacco, and a bitter taste. It is volatile, insoluble in water and the dilute acids, but soluble in ether and caustic potash. According to Landerer (*Pharm. Central-Blatt für* 1835, S. 890), fresh tobacco leaves yield no nicotianin, which, therefore, would appear to be developed by the drying of the leaves under the influence of air and water. Nicotianin excites, in the tongue and throat, a sensation similar to that caused by tobacco smoke. Hermbstädt swallowed a grain of it, and experienced, soon after, giddiness, nausea, and inclination to vomit. Applied to the nose, it causes sneezing.

3. *Empyreumatic Oil of Tobacco.*—Is rather less solid than the empyreumatic oil of foxglove (see p. 838); but it is undistinguishable from the latter by either taste or smell (Morries, *Ed. Med. and Surg. Journ.* vol. xxxix. p. 379). It is produced, in part at least, by the decomposition of some of the constituents of tobacco. It has been suggested, that this oil is "*the juice of cursed hebenon*," alluded to by Shakspeare (*Hamlet*, Act 1, Scene 5), who also calls it a "*distilment.*"

4. *Tobacco Smoke.*—The constituents of tobacco-smoke, according to Raab (Zenker and Schenk, *Naturgesch. d. vorzüg. Handelspfl.* Bd. ii. S. 75), are much *carbonate of ammonia*, *acetate of ammonia*, *nicotianin*, *empyreumatic oil*, *carbonaceous matter* (soot), *moisture*, and several *gases*. Unverdorben (Poggendorf's *Annalen*, viii. 399) obtained, by the dry distillation of tobacco, water, oil, and resin. These products consisted of, *a volatile oil*, *an oleaginous acid*, *an empyreumatic acid* (Brandsäure), *resin*, traces of *a powder insoluble in potash and acids*, a small quantity of *odorin*, *a base soluble in water* (nicotin?), *fuscin*, *red matter* soluble in acids, and *two extractive matters*, one forming a soluble, the other an insoluble, compound with lime.

Physiological Effects. (*a.*) *On animals generally.*—In the *carnivora* tobacco causes nausea, vomiting, sometimes purging, universal trembling, staggering, convulsive movements, and stupor. Five drachms and a half of rappee introduced into the stomach of a dog, and secured by a ligature on the œsophagus, caused death in nine hours. In another experiment, two drachms applied to a wound killed the animal in an hour (Orfila, *Tox. Gén.*) Sir B. Brodie (*Phil. Trans.* for 1811, p. 178) found that the infusion of tobacco, thrown into the rectum, paralyzed the heart, and caused death in a few minutes. But if the head of the animal be previously removed, and artificial respiration kept up, the heart remains unaffected; proving that tobacco disorders this organ through the medium of the nervous system only. In the *herbivora* the effects of tobacco, as of other vegetable poisons, are much less marked: vomiting does not occur. Schubarth (Wibmer, *Wirk. d. Arzneim. ü. Gift.* Bd. iii. S. 336) gave four ounces of the leaves to a horse, at three times, within two hours. The pulse became irregular, then slower, afterwards quicker: respiration and the pupils were scarcely affected. For two days the stools and urine were more frequent. Moiroud (*Pharm. Vét.* p. 364) observed no remarkable effect from the exhibition of a decoction of four ounces of tobacco to a horse.

It is remarkable that the *empyreumatic oil of tobacco* does not possess the same power of paralyzing the heart. Applied to the tongue of a cat, one drop caused convulsions, and in two minutes death: on opening the body, the heart was beating regularly and with force (Brodie, *op. cit.*) Its operation, therefore, is analogous to that of hydrocyanic acid. Dr. Morries (*Ed. Med. and Surg. Journ.* vol. xxxix. p. 383) says, it has less tendency to induce convulsions than the empyreumatic oils of foxglove, henbane, or the thornapple.

(*b.*) *On man.—In small doses,* tobacco causes a sensation of heat in the throat, and sometimes a feeling of warmth at the stomach; these effects, however, are less obvious when the remedy is taken in a liquid form and largely diluted. By repetition it usually operates as a diuretic, and less frequently as a laxative. Accompanying these effects are oftentimes nausea and a peculiar feeling usually described as giddiness, but which scarcely accords with the ordinary acceptation of this term. As dropsical swellings sometimes disappear under the use of these doses, it has been inferred that the remedy promotes the operation of the absorbents. *In larger doses* it provokes nausea, vomiting, and purging. Though it seldom gives rise to abdominal pain, it produces a most distressing sensation of sinking at the pit of the stomach. It occasionally acts as an anodyne, or more rarely promotes sleep. But its most remarkable effects are languor, feebleness, relaxation of muscles, trembling of the limbs, great anxiety, and tendency to faint. Vision is frequently enfeebled; the ideas confused; the pulse small and weak; the respiration somewhat laborious; the surface cold and clammy, or bathed in a cold sweat; and, in extreme cases, convulsive movements are observed. *In excessive doses* the effects are of the same kind, but more violent in degree. The more prominent symptoms are nausea, vomiting, and, in some cases, purging, extreme weakness and relaxation of the muscles, depression of the vascular system (manifested by feeble pulse, pale face, cold sweats, and tendency to faint), convulsive movements, followed by paralysis and a kind of torpor, terminating in death.

Taken in the form of *snuff* its principal effect is topical. It causes increased secretion of nasal mucus, and, in those unaccustomed to its use, sneezing. Getting into the throat it produces a feeling of acridity, and sometimes nausea. From some kinds of rappee I have experienced giddiness and great prostration of strength. Lanzoni (Christison, *On Poisons*) states, that an individual fell into a state of somnolency, and died lethargic on the twelfth day, in consequence of taking too much snuff. Reasonable doubt, however, may be entertained, I think, whether these accidents really arose from snuff. The habitual use of this substance blunts the sense of smell and alters the tone of voice; but I am unacquainted with any other well-ascertained effects, though Cullen (*Mat. Med.* ii. 274) ascribes loss of appetite and dyspepsia to it. I have known several inveterate snuff-takers who, after many years' use of this substance, have discontinued it with impunity; but Dr. Cullen thinks that when the discharge of mucus is considerable, the ceasing or suppression of it, by abstaining from snuff, is ready to occasion the very disorders of headache, toothache, and ophthalmia, which it had formerly relieved. There does not appear to be any good grounds for the supposed baneful effects of the manufacture of snuff on the workmen (Christison, *op. cit.*) Sir W. Temple (*Letters*, p. 286, fol. 1720) recommends the introduction of a tobacco leaf into the nostrils for the relief of affections of the eyes and head.

The *smoking* of tobacco by those unaccustomed to it, gives rise to all the before-described effects of large and excessive doses. A very interesting case, which had almost terminated fatally, is related by Dr. Marshall Hall (*Edin. Med. and Surg. Journ.* vol. xii. p. 11). It was that of a young man, who, for his first essay, smoked two pipes. Gmelin (quoted by Christison) mentions two cases of death from smoking, in the one of seventeen, in the other of eighteen, pipes at a sitting.

In habitual smokers, the practice, when employed moderately, provokes thirst, increases the secretion of saliva and buccal mucus, and produces a remarkable soothing and tranquillizing effect on the mind, which has made it so much admired and adopted by all classes of society, and by all nations civilized and barbarous. I am not acquainted with any well-ascertained ill effects resulting from the habitual practice of smoking. A similar observation is made by Dr. Christison (*op. cit.* p. 774). There does not appear to be any good grounds for supposing that smoking is a prophylactic against contagious and epidemic diseases—an opinion at one time entertained.

The practice of *chewing* tobacco is principally confined to sailors, and is less frequently submitted to our observation, so that we are not so competent to speak of its effects, which, probably, are similar to those caused by smoking.

The application of tobacco to abraded surfaces is a very dangerous practice, and has in some instances been attended with violent or even fatal results. Mr. Weston (*Med. and Phys. Journ.* vol. xiv. p. 305) has related a case, in which the expressed juice of tobacco was applied to the head of a boy, aged eight years, for the cure of tinea capitis. Death took place three hours and a half after the application.

In the form of *clyster* tobacco has frequently proved fatal, sometimes from the use of inordinate doses by ignorant persons (Christison, *op. cit.*), and occasionally in the hands of the well-informed practitioner. Desault (*Œuvres Chir.* t. ii. p. 344) has witnessed the smoke prove fatal. Sir A. Cooper (*Anat. and Treatm. of Hernia*, p. 24) has seen two drachms, and even one drachm, destroy life. In a case related by Sir Charles Bell (*Surg. Obs.* part 2, p. 189) death probably occurred from the same cause. Dr. Copland (*Dict. of Pract. Med.* art. *Colic*, vol. i. p. 371) saw half a drachm in infusion prove fatal.

The operation of tobacco resembles that of *Lobelia inflata* (see Lobeliaceæ). With foxglove, tobacco agrees in several circumstances, especially in that of enfeebling the action of the vascular system (see p. 842); though its power in this respect is inferior to that of foxglove. In its capability of causing relaxation and depression of the muscular system, and trembling, tobacco surpasses foxglove; as it does also in its power of promoting the secretions. From belladonna, stramonium, and hyoscyamus, it is distinguished by causing contraction of the pupil, both when applied to the eye and when taken internally in poisonous doses; and also by the absence of delirium and of any affection of the parts about the throat. Vogt (*Pharmakodyn.*) and Sundelin (*Handb. d. spec. Heilmittell.*) have considered the effects of tobacco as closely allied to those of aconite; but to me the resemblance appears very slight (see RANUNCULACEÆ). The power possessed by the last-mentioned substance of paralyzing the sentient nerves, sufficiently distinguishes it from tobacco.

USES.—The principal remedial value of tobacco consists in its power of relaxing muscular fibres, whereby it becomes a valuable antispasmodic. As a purgative, but especially as an antispasmodic and purgative conjoined, it is exceedingly serviceable in alvine obstructions. As a sedative to the vascular system it has not been much used. I tried it somewhat extensively a few years since, as a substitute for bloodletting in inflammatory affections. But, while it produced such distressing nausea and depression, that it was with difficulty I could induce patients to persevere in its use, I did not find its antiphlogistic powers at all proportionate, and eventually I discontinued its employment. As an anodyne, diuretic, or emetic, it is much inferior to many other articles of the Materia Medica.

1. *In Colic, Ileus* (*Volvulus*), *Strangulated Hernia, and Constipation.*—The efficacy of tobacco in these diseases depends principally on its power of relaxing muscular fibres and on its purgative properties. These effects are usually accompanied with nausea and giddiness. The remedy is applied in the form of clyster, consisting either of the infusion, or of the smoke. The latter was at one time supposed to be more efficacious. Heberden (*Comment. on the Hist. and Cure of Diseases*, p. 270, 3d ed. 1806) says, it causes less giddiness than the infusion. It probably extends farther up the intestines than the liquid enema, and, therefore, acts on a larger surface. But the difficulties and inconvenience of applying it, and the uncertainty of its effects, have led, for the most part, to the discontinuance of its use. In *ileus* the tobacco clyster has been recommended by Sydenham (*Whole Works*, 4th ed. by Pechey, p. 428), by Heberden (*op. cit.*), by Abercrombie (*On Diseases of the Abdom. Viscera*), and by several other distinguished authorities. The earlier it is resorted to, the more successful is it likely to prove. Indeed, when employed in the last stage of the disease, it sometimes hastens the fatal termination by exhausting the already depressed vital powers. As it is occasionally necessary to repeat the injection, it is of importance to begin cautiously. Dr. Abercrombie uses only fifteen grains of tobacco infused in six ounces of boiling water for ten minutes; and he repeats this in an hour if no effect have been produced. I have generally employed a scruple, and have not experienced any dangerous effects from its application; and it is possible that, in persons long accustomed to the use of tobacco, a somewhat larger dose might be required; but I have never met with any cases in which a scruple did not produce the full effect on the system that was desired. In *strangulated hernia* the tobacco clyster has frequently effected the return of the protruded parts when the operation appeared almost inevitable; and every surgical writer speaks in the

highest terms of its use. A tense hernial tumor sometimes becomes soft and relaxed by the diminished force of circulation produced by tobacco. Notwithstanding these facts, this remedy is much less frequently resorted to than formerly. Three circumstances have, I suspect, led to the infrequency of its use:—first, the dangerous, if not fatal, consequences which have sometimes resulted from its employment; secondly, the frequency of its failure and the consequent loss of time, by which the chance of recovery is diminished; thirdly, the operation for hernia being much less dreaded now than formerly, for experience has fully proved that death rarely (Mr. Pott says only once in fifty times) results from it. In *colic* from lead, and *in obstinate constipation* from spasmodic constriction, the tobacco clyster has sometimes proved most beneficial. Of the application in lead colic, of compresses, soaked in a strong decoction of tobacco to the abdomen, as recommended by Dr. Graves (*Dubl. Hosp. Rep.* vol. iv.) I have no experience. The practice is, of course, calculated to be beneficial, but is less certain and speedy in its effect than tobacco clysters.

2. *In Ischuria and Dysury.*—When retention of urine arises from spasm of the neck of the bladder or from spasmodic stricture, tobacco, by its powerfully relaxing properties, is an agent well calculated to give relief. Mr. Earle (*Med. Chir. Trans.*) vol. vi. p. 82) has published several cases illustrative of its efficacy. In dysury, also, tobacco proves serviceable: it abates pain, relaxes the urinary passages, promotes the secretion of urine, and, by diminishing the sensibility of the parts, facilitates the expulsion of calcareous matter (Fowler, *Med. Rep. of the Effects of Tobacco*, 1785).

3. *Tetanus.*—The relaxing influence over the muscular system possessed by tobacco, suggested the employment of this remedy in tetanus. Its effects have been, like those of most other medicines in this disease, unequal. Sir J. Macgrigor (*Med.-Chir. Trans.* vol. vi. p. 456) says, that, in the advanced stage of the malady the tobacco clyster had no effect. Mr. Earle (*Ibid.* p. 92), however, thought it afforded temporary alleviation in a case in which he tried it. Since then several cases have been successfully treated by tobacco. Dr. O'Beirne (*Dubl. Hosp. Rep.* vol. iii.) obtained most marked relief by its use. He employed it in the form of clyster (containing a scruple of tobacco), which was repeated twice or thrice or oftener daily during eighteen days; and it was observed, that if by design or accident the remedy was discontinued, the spasms recurred with force. Mr. Anderson (*Edinb. Med.-Chir. Trans.* vols. i. and ii.) employed a decoction of the fresh leaves in the form of enema, and both with good effect. Mr. Curling (*Treat. on Tetanus*, p. 168, 1836) has collected accounts of nineteen cases (including those of Earle, O'Beirne, and Anderson, above referred to) treated by tobacco: of these nine recovered; and, in seven of the fatal cases, the remedy had not a fair trial; while in the eighth, organic disease of the brain was found. Mr. Curling observes, that "more has now been advanced in proof of the efficacy of tobacco than can be adduced in favour of any other remedy yet resorted to. I have not," he adds, "succeeded in finding a single case, in which, being fully and fairly tried before the constitution had given way, it has been known to fail" (*op. cit.* p. 177).

4. *Other Spasmodic Diseases.*—The success attending the use of tobacco in tetanus, has led to its employment in *hydrophobia*, but hitherto

without avail. In a case of periodical *epilepsy*, Dr. Currie (*Med. Rep.* vol. i. p. 163) prevented the return of the disease by the application of a tobacco cataplasm to the scrobiculus cordis, half an hour before the expected paroxysm. In a very bad case of *spasm of the rima glottidis*, which resisted powerful depletion by the lancet, Dr. Wood (*United States Dispens.*) applied with success a tobacco cataplasm to the throat. In *spasmodic asthma*, tobacco, either smoked or taken internally, in nauseating doses, has been found occasionally to give relief. My own observation is unfavourable to the use of tobacco smoke, which I have repeatedly found to bring on convulsive cough and spasmodic difficulty of breathing in persons afflicted with chronic catarrh. Dr. Sigmond (*Lancet* for 1836-7, vol. ii. pp. 253-4) says, the tincture of tobacco has been sold and used to a great extent, under the name of tincture of lobelia, and that it proved successful in spasmodic asthma. In *rigidity of the os uteri*, a tobacco clyster failed to produce relaxation, while it caused alarming constitutional symptoms (Dr. Dewees, *Comp. Syst. of Midwif.* p. 378, 1825).

5. *In Dropsy.*—Tobacco was recommended, as a diuretic in dropsy, by Dr. Fowler (*op. supracit.*), who published a number of cases of anasarca and ascites which had been relieved by it. (See also Garnett, in *Duncan's Med. Comment.* for 1797, Dec. 11, vol. vi.) Whatever benefit may have been obtained, in these cases, by the use of tobacco, should be ascribed, I suspect, rather to the sedative powers of this agent, than to its influence over the kidneys. In small doses it is an uncertain diuretic, and in larger doses it causes such distressing nausea and depression, that practitioners have long since ceased to use it in dropsical cases. The ashes of the tobacco plant have also been used in dropsy (Garden, in *Duncan's Med. Com.* Dec. 1, vol. iii.)

6. *As a topical remedy.*—Dr. Vetch (*Med.-Chir. Trans.* vol. xvi. p. 356) recommends the infusion, as an anodyne and sedative topical application, in gouty and rheumatic inflammation of the joints, testicle, and sclerotic coat of the eye, and in erysipelatous inflammation. Bergius (*Mat. Med.* i. 122) recommends a fomentation of tobacco leaves in phimosis and paraphimosis. An infusion or ointment of tobacco has been used in porrigo and other skin diseases, as well as in some obstinate ulcers. The smoke, applied to the hair, is a popular means of destroying pediculi. Dr. Sigmond (*Lancet*, 1836-7, vol. ii. p. 249) says, tobacco promotes the growth of the hair. Toothache has been relieved by tobacco smoke.

In addition to the preceding, there are various other diseases against which tobacco has been employed. Thus in *soporose affections* and *asphyxia*, tobacco clysters have been employed; but they are more likely to do harm than good. Tobacco has also been used as an *anthelmintic*.

Administration.—Tobacco is rarely administered *in substance*. Five or six grs. of snuff have been taken as an emetic, and are said to have operated as effectually as two grains of emetic tartar. For internal administration the *wine of tobacco* is generally employed. Dr. Fowler used an *infusion* (prepared with an ounce of Virginian tobacco to a pound of boiling water), which he gave in doses of from sixty to a hundred drops. The best time for administering it he found to be two hours before dinner and at bed-time. The usual *tobacco enema* is the infusion prepared according to the Pharmacopœia. The *tobacco-smoke clyster* (*clyster e fumo tabaci*) is applied by means of a proper apparatus, formerly kept by the instrument-makers. Various extemporaneous methods of employing it have been devised (*Murray*, *App. Med.* t. i.) For external use tobacco is used in the form of *cataplasm* (made of the leaves and water or vinegar), *infusion* (the *tobacco-water* of the shops), *smoke*, and *ointment:* all these, however, require great caution in their use, especially when applied to abraded surfaces.

1. *Enema Tabaci*, L.E.; *Infusum Tabaci*, D.—(Tobacco, ʒj. [grs. xv. to ʒss. *E.*]; Boiling Water, Oj. [Oj. wine measure, *D.* f℥viij. *E.*] Macerate for an hour [half an hour, *E.*], and strain). The want of uniformity in the formulæ of the British colleges is greatly to be regretted; and I cannot but think that the latitude permitted by the Edinburgh College, in the quantity of tobacco employed, is highly objectionable, and calculated to lead to serious errors in dispensing. The tobacco clyster is used, as I have already stated, in ileus (volvulus), strangulated hernia, obstinate constipation, retention of urine, &c. It is not to be forgotten that two drachms, one drachm, and even half a drachm of tobacco infused in water, have proved fatal, as I have above mentioned. The cautious practitioner, therefore, will not use more than fifteen or twenty grains.

2. *Vinum Tabaci*, E.—(Tobacco, ℥j.; Sherry, f℥xij. Digest for seven days, strain, express strongly the residuum, and filter the liquors). Sedative and diuretic. Employed in dropsy, dysury, &c. Rarely used. Dose from ♏x. to ♏l.

3. *Unguentum Tabaci*, Ph. United States.—(Fresh Tobacco, cut in pieces, ℥j.; Lard, lbj. Boil the tobacco in the lard, over a gentle fire, until it becomes friable; then strain through linen). Employed as an application to irritable ulcers and skin diseases, especially tinea capitis; but its use requires great caution.

An *ointment*, prepared with twenty drops of the empyreumatic oil of tobacco and an ounce of simple ointment, has been applied with advantage by American practitioners, to indolent tumors and ulcers; but like all preparations of tobacco, when employed externally, must be used with great caution (*United States Dispensatory*).

Antidotes.—If the poison have been swallowed, let the contents of the stomach be withdrawn as speedily as possible. No chemical antidote has as yet been demonstrated; but the vegetable astringents (infusion of nutgalls, green tea, &c.) deserve examination. As anti-narcotics, the vegetable acids and coffee may be administered. The other parts of the treatment must be adapted to circumstances. When the depression of the vascular system is extreme, ammonia and brandy may be administered with good effect, and frictions employed: even acupuncture of the heart (!) has been suggested (Stephenson and Churchill, *Med. Bot.*) Artificial respiration should not be omitted, when other means have failed. If apoplectic symptoms present themselves, blood-letting may, perhaps, be requisite, as in the case related by Dr. M. Hall.

Sola'num Dulcama'ra, Linn., L. E. D.—*Woody Nightshade; Bitter-sweet.*

Sex. Syst. Pentandria, Monogynia.

(Caulis, *L.*—Twigs, *E.*—Caules, *D.*)

History.—Sprengel (*Hist. Rei Herb.* vol. i. p. 227) considers this plant to be the *Citocatia* of the Abbess Hildegard, of Bilgen, who died

A.D. 1180. But the derivation of the word Citocatia (*cito* and *cacare*) negatives, in my opinion, this supposition. The first undoubted notice of Dulcamara occurs in the work of Tragus (Sprengel, *op. cit.* p. 319).

BOTANY. *GEN. CHAR.*—*Calyx* permanent, five- to ten-parted. *Corolla* rotate; the tube very short; the limb four- to six-divided, spreading. *Anthers* four to six, oblong, dehiscing at the apex by two pores. *Berry* roundish, two- to six-celled. *Embryo* spiral (*Bot. Gall.*)

SP. CHAR.—*Stem* shrubby, zigzag, without thorns. Upper *leaves* hastate. *Clusters* cymose (Smith).

Root woody. *Stem* twining, branched, rising (when supported) to the height of many feet. *Leaves* acute, generally smooth; the lower ones ovate, or heart-shaped; upper more or less perfectly halbert-shaped; all entire at the margin. *Clusters* either opposite to the leaves or terminal, drooping, spreading, smooth, alternately subdivided. *Bracts* minute. *Flowers* elegant, purple, with two round green spots at the base of each segment. *Berries* oval, scarlet, juicy.

HAB.—Indigenous. In hedges and thickets, especially in watery situations. Flowers in June and July.

DESCRIPTION.—The annual stems (*caules* seu *stipites dulcamaræ*) are collected in the autumn, after the leaves have fallen. When fresh they have an unpleasant odour, which they lose by drying. Their taste is at first bitter, afterwards slightly acrid and sweet. The epidermis is greenish-gray, the wood light, and the pith very light and spongy.

COMPOSITION.—The stems have been analyzed by Pfaff (*Syst. d. Mat. Med.* Bd. vi. S. 506). 100 parts of air-dried stems lost 17·4 parts of water when completely dried. From 100 parts of perfectly dried stems, Pfaff obtained—*bitter, sweet extractive* (*picroglycion*) 21·817, *vegeto-animal matter* 3·125, *gummy extractive* 12·029, *gluten with green wax* 1·4, *resin containing benzoic acid* 2·74, *gummy extractive, starch, sulphate* and *vegetable salts of lime* 2·0, *oxalate* and *phosphate of lime with extractive* 4·0, and *woody fibre* 62·0 (excess 9·111). Desfosses (*Journ. de Pharm.* t. vii. p. 414) discovered *solanina* in the stems.

1. *Picroglycion*, Pfaff (*Dulcarin*, Desfosse).—Crystalline, has both a bitter and a sweet taste, is fusible, soluble in water, alcohol, and acetic ether, and is not precipitated from its solution by either infusion of nutgalls or metallic salts (Soubeiran, *Traité de Pharm.* t. ii. p. 52). Pelletier (*Journ. de Pharm.* vii. 416) thinks it is sugar combined with solanina.

2. *Solanina.*—Resembles sulphate of quina, but its needle-like crystals are finer and shorter. It restores the blue colour of litmus paper reddened by an acid. It dissolves in acids, and is precipitated from its solution by the caustic alkalies. Some of the salts (as the acetate and hydrochlorate) have a gummy appearance when evaporated to dryness: others (as the phosphate and sulphate) are crystallizable. According to Blanchet it consists of *Carbon* 62·11, *Hydrogen* 8·92, *Nitrogen* 1·64, *Oxygen* 27·33. If this analysis be correct, solanina differs from the other vegetable alkalies in the small quantity of nitrogen which it contains. A grain of solanina, dissolved in dilute sulphuric acid, killed a rabbit in six hours: four grains of the sulphate caused, in an hour, paralysis of the hind legs, and, in eight hours, death (Otto, *Pharm. Central-Blatt für* 1834, S. 455). Soubeiran says it does not dilate the pupils like the other alkalies of Solanaceæ.

PHYSIOLOGICAL EFFECTS.—Not very obvious. Its decoction operates as a diaphoretic and diuretic. It is said also to promote secretion from the mucous surfaces, and to diminish sensibility. In excessive doses dulcamara is stated to have acted as an acro-narcotic (Murray, *App. Med.* t. i. p. 60; and Schlegel, *Hufeland's Journ.* Bd. liv. St. 2, S. 27). Chevallier (*Dict. des Drog.* t. ii. p. 229) says, a young man experienced narcotism from carrying a bundle of the plant on his head. But the accuracy of all these observations has been called in question by Jos. Frank (*Handb. d. Toxicol.* S. 61, 1803); by Dunal, and by Fages (Orfila, *Toxicol. Gén.*) The first gave the decoction, the latter the extract and fruit, in very large doses, without any obvious effects.

Uses.—Dulcamara has been thought serviceable in chronic pulmonary catarrhs, in rheumatic gouty complaints, in chronic skin diseases, and in various cachectic conditions of the system, in which sarsaparilla has been found beneficial. As a remedy for lepra, it was introduced to the notice of British practitioners by Dr. Crichton. For this disease it has been declared a most effectual remedy by Bateman (*Synopsis of Cutan. Diseases*); while Rayer (*Treat. on Dis. of the Skin*, by Dr. Willis, p. 91), speaks of its good effects in eczema and psoriasis. In the few cases in which I have tried it, it proved useless.

Decoctum Dulcamaræ, L. E. D.—(Dulcamara, sliced [chopped down, *E.*], ℥x.; Water [distilled, *L.*], Oiss. Boil down to a pint, and strain). Diaphoretic and diuretic. The usual dose, stated in books, is f℥ss. to f℥j. But I have given f℥iv. at a dose. Rayer has given four ounces of the root in decoction in twenty-four hours.

Cap'sicum an'nuum, Linn. L. E. D.—*Common Capsicum; Chilly.*

Sex. Syst. Pentandria, Monogynia.

(Baccæ, *L.*—Fruit of Capsicum annuum and other species; Capsicum or Chillies, *E.*—Capsulæ cum seminibus, *D.*)

History.—The *Piperitis* or *Siliquastrum* of Pliny (*Hist. Nat.* lib. xix. cap. 62; and lib. xx. cap. 66, ed. Valp.) is declared by Sprengel (*Hist. Rei Herb.* vol. i. p. 201) to be undoubtedly Capsicum annuum. But confidence in this opinion is greatly diminished by the doubt entertained as to this plant being a native of Asia (Roxburgh, *Fl. Ind.* vol. i. p. 573; Royle, *Illustr.* p. 279). Of course, if it be exclusively a native of America, there is no reason for supposing that Pliny could have been acquainted with it. The term capsicum (κάψικον) occurs first in Actuarius.

Botany. *Gen. Char.*—*Calyx* five-toothed, persistent. *Corolla* rotate, five-cleft. *Anthers* converging, two-celled, dehiscing by fissures. *Berry* juiceless, papery, hollow, two- to four-celled, many-seeded, naked. *Seeds* naked (Nees von Esenbeck, *Trans. Linn. Soc.* vol. xvii. part i. p. 62).

Sp. Char.—*Peduncles* solitary. *Fruit* oblong, pendulous. *Petioles* smooth. *Stem* herbaceous. (Willdenow.)

Herbaceous annual, one to two feet high. *Leaves* ovate or oblong, acuminate, long-stalked, almost entire, sometimes hairy on the veins underneath. *Flowers* white. *Berry* either scarlet or yellow, variable in shape, being oblong, round, or cordate.

Hab.—America. A doubtful native of the East Indies. Cultivated in England.

Description.—The dried fruit, sold by druggists as *chillies*, is flat, more or less shrivelled, oblong, blunt or pointed at one end, while the calyx and stalk are usually attached at the other end. The length of the berry (independent of the stalk) is two or three inches, the breadth one-half to three-quarters of an inch, the colour yellowish or reddish-brown, the taste hot and pungent, the odour none. The epidermis is tough and leathery: the seeds are flattened and whitish. The recent fruit, called *capsicum* or *chillies*, grown in this country, and sold for pickling, is, when ripe, yellow or red, but it is frequently gathered green: its size and shape are variable: the *oblong* varieties are from one to three or four inches long; the *round* variety (*cherry chilly*) is about as large as a cherry.

Composition.—The fruit was analyzed, in 1816, by Maurach (*Berl. Jahrb.* Bd. xvii. S. 63); in the same year by Bucholz (Gmelin, *Handb. d. Chem.* ii. 1310); and in the year following by Braconnot (*Ann. de Chim. Phys.* vi. 122).

Bucholz's Analysis.

Acrid soft resin (*capsicin*)	4·0
Wax	7·6
Bitter aromatic extractive	8·6
Extractive with some gum	21·0
Gum	9·2
Albuminous matter	3·2
Woody fibre	28·0
Water	12·0
Loss	6·4
Fruit of Capsicum annuum without seeds	100·0

Braconnot's Analysis.

Acrid oil	1·9
Wax with red colouring matter	0·9
Brownish starchy matter	9·0
Peculiar gum	6·0
Animalized matter	5·9
Woody fibre	67·8
Salts (citrate of potash 6·0, phosphate of potash, and chloride of potassium 3·4)	9·4
Fruit of Capsicum annuum	100·0

Capsicin, Bucholz (*Acrid Soft Resin*; *Acrid Oil*, Braconnot).—Obtained by digesting the alcoholic extract in ether, and evaporating the etherial solution. It is a thick liquid, of a yellowish-red or reddish-brown colour, which becomes very fluid when heated, and, at a higher temperature, is dissipated in fumes. Half a grain of it, volatilized in a large room, causes all who respire the air of the room to cough and sneeze. By exposure to air and light it solidifies. It is decolorized by chlorine. It is slightly soluble in water and in vinegar; but very much so in alcohol, ether, oil of turpentine, and the caustic alkalies. With baryta it forms a solid acrid combination.

Physiological Effects.—Capsicum belongs to the acrid aromatics (see p. 72), and is more closely allied, by its effects, to the peppers (see p. 752) than to any other article of the Materia Medica. Sundelin (*Handb. d. sp. Heilm.* Bd. ii. S. 44, 3tte Aufl.) however, considers it to be more related to pyrethrum. Its active principle is more fixed, and its operation is more permanent and violent, than mustard or horse-radish.

Its hot and fiery taste is familiar to every one. Applied to the skin, capsicum proves rubefacient and vesicant. Swallowed *in small doses*, it creates a sensation of warmth in the stomach, and in torpid and languid habits proves a valuable stimulant, and a promoter of the digestive functions. Taken *in somewhat larger quantities*, it produces a glow over the body, excites thirst, and quickens the pulse: the latter effect, however, is not in proportion to its local effect. Like the peppers, it is said to exercise a stimulant influence over the urino-genital organs. *In excessive doses*, we can easily believe that vomiting, purging, abdominal pain, and gastric inflammation, ascribed to it by Vogt (*Pharmakodyn.* Bd. ii. S. 581, 2te Aufl.), may be induced by it, though I am not acquainted with any cases in which these effects have occurred. Richter (*Ausf. Arzneim.* Bd. ii. S. 179) mentions, in addition to the symptoms just mentioned, a paralyzed and altered condition of the nervous influence, an affection of the head, drunkenness, and giddiness, as being produced by large doses.

Uses.—Capsicum is more employed as a *condiment* than as a medicine. It is added to various articles of food, either to improve their flavour, or, if difficult of digestion, to promote their assimilation, and to prevent flatulence. The inhabitants of tropical climates employ it to stimulate the digestive organs, and thereby to counteract the relaxing and enervating influence of hot climates.

As a *medicine* it is principally valuable as a local stimulant to the mouth, throat, and stomach. Its constitutional not being in proportion to its topical effects, it is of little value as a general or diffusible stimulant. Administered internally capsicum has long been esteemed in cases of *cynanche maligna*. It was used, in 1786, with great success, by Mr. Stephens (Duncan's *Med. Comment.* Dec. 2nd, vol. ii. 1788), and by Mr. Collins (*Med. Communications*, vol. ii. p. 372, 1790). It promoted the separation of the sloughs, and soon improved the constitutional symptoms. Mr. Headby (*Lond. Med. and Phys. Journ.* vol. v. p. 425, 1801) also employed it both internally and by way of gargle. Its use has been extended to *scarlatina anginosa* (Kreysig, *U. d. Scharlachfieber*, 1802, in Voigtel's *Arzneim.*) As a gargle in relaxed conditions of the throat, its efficacy is undoubted. The powder or tincture may be applied by means of a camel's-hair pencil to a relaxed uvula. It is a very useful and valuable gastric stimulant in enfeebled, languid, and torpid conditions of the stomach. Thus, in the dyspepsia of drunkards, as well as of gouty subjects, it has been found useful (Chapman, *Elem. of Therap.* vol. ii.) In various diseases, attended with diminished susceptibility of stomach, capsicum is an exceedingly useful adjunct to other powerful remedies, the operation of which it promotes by raising the dormant sensibility of this viscus: as in cholera, intermittents, low forms of fever, dropsies, &c. Dr. Wright (*Med. Facts and Observ.* vol. vii.) speaks in high terms of it as a remedy for obviating the black vomit—a symptom of the fever of tropical climates, at one time considered fatal. A capsicum cataplasm may be used with advantage to occasion rubefaction, in any cases in which a rubefacient counter-irritant is indicated; as in the coma and delirium of fever, in chronic rheumatism, &c.: unless kept on for a long period it does not vesicate.

Administration.—The *powder* of capsicum is usually given in doses of from gr. v. to gr. x., made into pills with crumbs of bread. The dose of the *tincture* will be mentioned presently. The *infusion* (prepared by digesting ʒij. of capsicum in f℥x. of boiling water for two hours) may be administered in doses of f℥ss. But, in malignant sore throat and scarlatina, capsicum has been employed in much larger doses. *Stephen's pepper medicine* consisted of two table-spoonfuls of small red pepper [*Capsicum frutescens*], or three of the common Cayenne pepper, and two tea-spoonfuls of fine salt, digested in half a pint of boiling water. To the liquor, strained when cold, half a pint of very sharp vinegar is added. A table-spoonful of this mixture is given to an adult every half hour. The *capsicum gargle* is prepared by infusing ʒss. of capsicum in a pint of boiling water; or by adding fʒvj. of the tincture to f℥viij. of the infusion of roses; or, in some cases, Stephen's pepper medicine may be used as a gargle.

Tinctura Capsici, L. E. D.—(Capsicum, bruised [or, if percolation be followed, in moderately fine powder, *E.*], ℥x.; Proof Spirit, Oij. Digest for fourteen [seven, *E.*] days, and strain [strain, squeeze the residuum, and filter the liquors. This tincture is best prepared by percolation, which may be commenced so soon as the capsicum is made into a pulp with a little of the spirit, *E.*]). Dose ♏x. to f℈j. Employed in the low stage of typhus and scarlet fevers, and in gangrenous sore throat, and to prevent the nausea which oil of turpentine is apt to occasion (*see* p. 716). Properly diluted, it may be used as a gargle, as above mentioned.

Other Dietetical, Medicinal, or Poisonous Solanaceæ.

Hyoscy'amus al'bus (*see* p. 849) is endowed with properties similar to those of *H. ni'ger*; for which it has sometimes been employed in medicine (Fouquier, *Archiv. gén. de Méd.* Mars, 1823; Chevallier, *Journ. de Chim. Méd.* t. ii. p. 36).

Mandrag'ora officina'lis, the *Mandrake*, is an acro-narcotic poison: when swallowed it purges violently (Brandt and Ratzburg, *Deutsch. phan. Giftgewächse*, S. 79). The roots, from their fancied resemblance to the human form, were called *anthropomorphon*, and were supposed to prevent barrenness (Matthiolus, *Comm. Dioscor.*) The root of *Tamus communis* is sold at the herb-shops as a substitute for mandrake.

Several species of *Datu'ra* are employed in the East: their effects and uses are analogous to those of *D. Stramo'nium*. In 1802 General Gent introduced *D. fe'rox* into this country as a remedy for asthma. It was employed by smoking it (*Ed. Med. and Surg. Journ.* vol. viii. p. 365; Waitz (Wibmer, *Wirk. d. Arzn. ü. Gift.* Bd. ii. S. 286) says, that half an unripe capsule acted violently on a girl. In 1811 Dr. Christie (*Ibid.* vol. vii. p. 158) directed attention to *D. fastuo'sa*. Mr. Skipton (*Trans. Med. and Phys. Soc. Calcutta*, vol. i. p. 121) administered the decoction of the root of this plant; and Dr. Adams (*Ibid.* p. 370) used a tincture (prepared as tincture of digitalis, *Ph. L.*) *D. Met'el* and *D. Tat'ula* appear to possess similar properties. Both species have been employed, especially in the East, to cause intoxication for criminal and licentious purposes (*Lond. Med. and Phys. Journ.* vol. xxv. p. 383-385; and vol. xxvi. p. 22). Schubarth (Wibmer, *op. cit.* p. 300) gave half a pound of the bruised leaves of D. Tatula to a horse without effect; twenty-one ounces of the half-ripe fruit caused dejection, increased secretion, and loss of appetite. *D. arbo'rea* operates like stramonium (Wibmer, *op. cit.* p. 285).

Sola'num ni'grum, or *Black Nightshade*, possesses narcotic properties, but its activity is not very great. It contains *solanina* (Brandt and Ratzburg, *Deutschl. phan. Giftgewächse*, S. 83; Orfila, *Toxicol. Gén.*) It has been employed in medicine as a resolvent (Gataker, *Obs. on the Use of Solanum*, 1757; Bromfield, *Account of the English Nightshades*, 1757).

Sola'num tubero'sum, or the *Potatoe*, is, next to the Cerealia, the most important vegetable for dietetical purposes. It was introduced into England, from America, in 1586, by Sir Walter Raleigh. The part employed as food is produced by the subterranean stems, and is called a *tuber*: the parts on it, called *eyes*, are buds, which, with another portion of the tuber, are used for multiplying the species, under the name of *sets*. The tissue of potatoes is cellular; each cell containing from ten to twelve grains of starch. Both in the cells and in the intercellular spaces is an albuminous liquid. By boiling the cells are separated, the starch grains absorb the albuminous liquid, swell up, and completely fill the cells; while the albumen coagulates, and forms irregular fibres, which are placed between the starch grains. Potatoes in which these changes are complete, are called *mealy*, while those in which the liquid is only partially absorbed, and the coagulation imperfectly effected, are denominated *doughy* or *watery* (Fritzsche, in *Poggendorf's Ann. d. Phys. ü. Chem.* Bd. xxxii. S. 159). Potatoes have been repeatedly subjected to chemical examination. The most important labours are those of Einhof, Lampadius, and Vauquelin (Gmelin's *Handb. d. Chem.* Bd. ii.; and Thomson's *Organ. Chem.*) The principal constituents of potatoes, are *starch*, *starchy fibrin*, *albumen*, *gum*, *acids*, *salts*, and *water*. The relative proportions vary with the season,

FIG. 181.

Solanum tuberosum.

the varieties of the potatoe, &c. Otto has discovered *solanina* in the potatoe, especially in the bud—a fact which explains the cause of the ill effects which have been observed to arise from the use of germinated potatoes by cattle (*Pharm. Central-Blatt für* 1834, S. 455). Payen and Persoz (Thomson, *Org. Chem.* p. 666) found *diastase* in the neighbourhood of the bud of the potatoe. *Potatoe starch* (*English Arrow-Root*, offic. *Amylum Solani tuberosi*) consists of particles of varied shapes and sizes; the normal form is probably ovate. Their size varies from one-six hundredth to one-thirtieth of a line in diameter. They are characterized by concentric rings observed on their surface, and which Fritzche (*op. cit.*) regards as indications of concentric layers, of which he asserts these grains to be composed. The particles of the fecula of *Canna coccinea* (see p. 680) present similar rings. *Potatoe Sago* is made of potatoe starch, near Paris. I have received some from Professor Guibourt, and find that it consists of whitish spheroidal masses, somewhat larger than those of pearl sago (see p. 614), of which it is an imitation. Potatoe starch has been analyzed by Berzelius and Guérin-Vary. According to the latter (*Journ. de Pharm.* t. xxii. p. 210), one hundred parts consist of 2·12 parts of matter insoluble in water (*tegumentary amylin*), of 38·13 of *soluble amidin*, and 59·75 of *amylin*: the *amidin* consists of $C^{14} H^{10} O^{8}$; the *amylin* of $C^{10} H^{5} O^{6}$. The quantity of starch obtained from potatoes varies with the kind used, as well as with the season: one hundred pounds of potatoes yield in August about 10 lbs, in September 14½ lbs, in October 14¾ lbs, in November 17 lbs, in March 17 lbs, in April 13¾ lbs, in May 10 lbs (Decandolle, *Phys. Vég.* p. 181). By fermentation potatoes yield a vinous liquid (*potatoe wine*) of good quality (Loudon's *Encycl. of Agricul.* p. 853). By distillation this yields *potatoe spirit* (Donovan, in Lardner's *Cycloped.*), from which a volatile oil (*oil of potatoes*) has been extracted (Pelletan, *Journ. de Chim. Méd.* t. i. p. 76). It consists, according to Dumas (*Journ. de Chim. Méd.* x. 705), of $C^{5} H^{6} O$. An *extract*, obtained from the stalks and leaves of potatoes, was declared by Dr. J. Latham (*Med. Trans.* vol. i. p. 92) to possess narcotic properties, in doses of two or three grains; but the cases adduced are not satisfactory. Furthermore, his experiments were repeated by Dr. Worsham (*United States Dispensatory*) with very different results; for 100 grs. produced no sensible effects. The observations of Nauche, however, tend to confirm Latham's statements. The tubers (potatoes), when boiled, are a valuable article of food, both for men and animals. Those of good quality are not only perfectly innocuous, but highly nutritious, and easy of digestion. In the raw state they have been found less nutritive for animals, while on man they are said to prove laxative and diuretic, and to excite, slightly, the nervous system (Nauche, *Journ. de Chim. Méd.* t. vii. p. 373). The process of cooking is probably useful in two ways; by rendering the starch digestible, and, secondly, by extracting some noxious matter. Nauche (*Ibid.*) found the decoction of potatoes endowed with medicinal properties; and Otto, as already mentioned, detected solanina in them. Potatoes have been praised as useful antiscorbutics (Julia-Fontenelle, *Ibid.* t. ii. p. 129).

Cap'sicum frutes'cens, Linn. yields the capsules sold by druggists as *Guinea pepper*, or *bird pepper* (*baccæ capsici*), as I have satisfied myself by comparing the commercial article with the East Indian Solanaceæ belonging to the Linnean Society. These capsules do not exceed an inch in length, and are about two or three lines broad: their colour is orange red; their odour aromatic and pungent. Their properties are similar to those of chillies (see p. 877), than which they are much hotter and more fiery. Their powder is *Cayenne pepper*, so extensively employed as a condiment. *Cayenne lozenges* and *essence of cayenne* (an alcoholic tincture) are kept in the shops.

ORDER 36. BORAGINA'CEÆ, *Lindley*.—THE BORAGE TRIBE.

BORAGINEÆ, *Jussieu*.

The plants of this Order are harmless, and, for the most part, inert. Their prevailing constituent is mucilage. Nitre is also found in some species. The colouring principle (*anchusic acid*) of *Anchu'sa tincto'ria*, or *Alkanet*, dissolves in fatty substances, and hence is employed to colour unguents and oils (as *lip salve* and *hair oil*). It becomes blue on the addition of an alkali.

ORDER 37. CONVOLVULA'CEÆ, *R. Brown.*—THE BINDWEED TRIBE.

CONVOLVULI, *Jussieu.*

ESSENTIAL CHARACTER.—*Calyx* five-sepaled. *Sepals* persistent, equal, or unequal, in one- three rows; often becoming enlarged. *Corolla* monopetalous, hypogynous, regular; the *limb* five-plicate, or five-lobed; contorted in æstivation. *Stamens* five, inserted into the corolla. *Anthers* often contorted after the ejection of the pollen. *Nectary* annular, often conspicuous. *Ovary* single, two- to four-celled; or two to four ovaries. *Cells* one- to two-seeded. *Style* one, entire or bifid. *Stigma* bilobed. *Fruit* dehiscing by the valves; rarely transversely. *Seeds* inserted into the base of the ovaries: *testa* black. *Cotyledons* foliaceous, corrugated. *Radicle* incurved, inferior.—Generally twining plants, with alternate, simple, entire, or lobed *leaves.* *Pedicles* bibracteate. *Stem* often filled with a milky purgative juice.

PROPERTIES.—The roots contain a milky purgative juice, which owes its essential properties to resin.

Convol'vulus Scammo'nia, Linn.—*The Scammony.*

Sex. Syst. Pentandria, Monogynia.

(Gummi-resina, *L. D.*—Gummy-resinous exudation from incisions into the root, *E.*)

HISTORY.—A purgative substance, called σκαμμώνια, was known to the Greeks long before the time of Hippocrates (Voigtel, *Arzneimittell.* Bd. i. S. 17; Bischoff, *Handb. d. Arzneimittell.* Bd. i. S. 40). The father of medicine, who frequently employed it, says that it evacuates, both upwards and downwards, bile and mucus, and expels flatus (*De Morb. Mul.* p. 597, ed. Fœs.) There is, however, some reason to believe that the ancients did not procure their scammony from the same plant which yields ours. Dierbach (*Arzneimittell. d. Hippokrates*, S. 138) thinks they prepared it from *Convolvulus sagittifolius*, Sibthorp. But Dr. Sibthorp (*Fl. Græca*, t. 192) refers the scammony of Dioscorides to the *Convolvulus farinosus*.

It deserves notice, that the term *scammonia* is applied by pharmacologists to purgative resinous substances obtained from *Convolvulaceæ*, and *Asclepiadaceæ.* At present I confine myself to the scammony procured from Convolvulaceæ. The other kind will be described hereafter (see p. 904).

BOTANY. *GEN. CHAR.*—*Sepals* five. *Corolla* campanulate. *Style* one. *Stigmas* two, linear-cylindrical, often revolute. *Ovary* two-celled, four-ovuled. *Capsule* two-celled, two-seeded (*Bot. Gall.*)

SP. CHAR.—*Leaves* sagittate, truncate behind. *Peduncles* rounded, about three-flowered.

Root perennial, tapering, three or four feet long, with an acrid, milky juice. *Stems* numerous, twining, herbaceous, smooth. *Leaves* on long petioles, acuminate, with pointed lobes at the base. *Peduncles* solitary, scarcely twice so long as the leaves. *Bracts* awl-shaped. *Sepals* obovate, truncated, with a reflexed point, coloured at the edge. *Corolla* pale yellow, with purple stripes. *Stamina* shorter than the corolla: *anthers* erect, sagittate. *Style* as long as the stamens: *stigmas* white.

HAB.—Hedges and bushy places in Greece and the Levant.

PREPARATION.—The method of procuring scammony, is, according to Dr. Russel (*Med. Obs. and Inq.* vol. i. p. 13. 1776), as follows:—

Having cleared away the earth from the upper part of the root, the peasants cut off the top in an oblique direction, about two inches below where the stalks spring from it. Under the most depending part of the slope they affix a shell, or some other convenient receptacle, into which the milky juice flows. It is then left about twelve hours, which time is sufficient for the drawing off the whole juice: this, however, is in small quantity, each root affording but a few drachms. This milky juice from the several roots is put together often into the leg of an old boot, for want of some more proper vessel, when in a little time it grows hard, and is the genuine scammony. It is, however, very probable that the process now mentioned is not the only one employed, but that others, similar to those described by Dioscorides and Mesue, are also resorted to. Moreover, various substances are added to scammony while yet soft. Dr. Russel says, wheat-flour, ashes, or fine sand; and, I may add, chalk.

Description.—Scammony is usually imported from Smyrna. Occasionally it comes by way of Trieste. Still more rarely it is brought from Alexandretta. It comes over in boxes and drums, which are frequently lined with tin. The finest kind is called *virgin* or *lachryma scammony*. Other varieties are denominated *seconds*, *thirds*, &c. Formerly the term *Aleppo scammony* was applied to the finer, and that of *Smyrna scammony* to the inferior kinds. No such distinction now exists in English commerce. The *scammony in shells*, and the *Antioch scammony*, described by Martius (*Pharmakogn.*) are unknown by those names to our principal dealers; nor is any distinct kind known as *Smyrna scammony*. I am informed by a Turkey merchant, who formerly resided at Smyrna, that scammony is brought into Smyrna, in the soft state, on camels. Here it is mixed with various impurities by persons (Jews), who are denominated scammony makers, and who adulterate it, and thereby lower its value to suit the market. Formerly the demand in London was principally for second and third qualities; but now virgin scammony is more in request, and is met with in much greater abundance.

The characters of good scammony are as follows:—It readily fractures between the fingers, or by the pressure of the nail; its sp. gr. is about 1·2; its fracture is dark, glistening, and resinous; its fractured surface should not effervesce on the addition of hydrochloric acid; the decoction of the powder, filtered and cooled, is not rendered blue by tincture of iodine; 100 grains, incinerated with nitrate of ammonia, yield about three grains of ashes (according to my experiments); sulphuric ether separates at least 78 per cent. of resin (principally) dried at 280° F. The Edinburgh College states, that ether separates "at least 80 per cent. of resin, dried at 280°;" but this statement applies only to the picked internal portions of fine virgin scammony, and not to average samples of commerce.

1. *Virgin Scammony* (*Lachryma Scammony*; *superior Aleppo scammony*, Guib.)—It usually occurs in amorphous pieces; but a careful examination of some large lumps has led me to believe that they formed portions of a mass, which, when in the soft state, had a rounded form. The whitish-grey powder, which covers some of the pieces, effervesces with hydrochloric acid; and I have no doubt, therefore, that the masses have been rolled in chalk. Virgin scammony is friable, easily reduced to

small fragments between the fingers, or by the pressure of the nail, and has, according to my experiments, a sp. gr. of 1·210. Its fractured surface is resinous, shining, greenish-black; presents small air cavities, and numerous grey semi-transparent splinters, or fragments, when examined by a magnifying glass, and does not effervesce on the addition of hydrochloric acid. When rubbed with the finger moistened with ether, water, or saliva, it readily forms a milky liquid. If we examine thin fragments, or splinters, by transmitted light, we observe them to be semi-transparent at the edges, and of a grey-brown colour. In the same piece we sometimes find some portions shining and blackish, as above described, while others are dull-greyish. This difference depends, probably, as Dr. Russel has suggested, on different methods of drying. Virgin scammony readily takes fire, and burns with a yellowish flame. Its odour is peculiar, somewhat analogous to old cheese: its taste is slight at first, afterwards acrid. The decoction of its powder, when filtered and cold, is not rendered blue by tincture of iodine. When incinerated in a crucible, it leaves a minute portion only of ash.

2. *Scammony of second quality.* (*Seconds*, Commerce.)—A few years since this was considered of the first quality. It includes two sub-varieties:—

α. Second Scammony in amorphous pieces.—In its external appearance, brittleness, odour, and taste, it resembles virgin scammony, from which it is distinguished by its greater sp. gr. (according to my experiments, being 1·463), its fracture being dull, or very slightly shining; and, by its colour, which is greyish. Hydrochloric acid causes effervescence when applied to a fractured surface. The decoction, when filtered and cold, is not rendered blue by iodine. This kind has been adulterated with chalk, but not with flour.

β. Second Scammony in large regular masses.—This kind is imported either in boxes or drums, into which it seems to have been introduced when soft, and to have hardened subsequently: hence its form is that of the package in which it was imported. A sample of a circular cake (about twelve inches diameter, and several inches thick) presents a dull-greyish fracture. Its sp. gr. according to my experiments, is 1·359. Hydrochloric acid, applied to the surface, causes effervescence. The decoction, filtered and cold, is rendered blue by iodine. This sub-variety, then, has been adulterated with both flour and chalk.

I have sometimes met with this kind of scammony having a soft or cheesy consistence.

3. *Scammony of third quality.* (*Thirds*, Commerce). Under this name I have received scammony in the form of circular flat cakes, about five inches in diameter, and one inch thick. They are heavy, dense, and much more difficult to fracture than the preceding kinds. The fractured surface, in some samples, is resinous and shining, in others dull; it has air cavities, and numerous small white specks (chalk); its colour is grayish to grayish-black. The sp. gr. varies, in different samples, from 1·276 to 1·543. Hydrochloric acid applied to a recently-fractured surface, causes effervescence. The decoction, filtered and cold, is rendered blue by tincture of iodine. Hence both flour and chalk have been used for adulteration. I have received portions of five cakes of this variety of scammony, on which were marked the actual quantity of chalk which

had been intermixed in each sample. In 100 parts of the cakes the proportions of chalk were respectively as follows:—13·07, 23·1, 25·0, 31·05, and 37·54. These numbers were furnished by the importer to one of our most respectable wholesale druggists, from whom I received them.

The foregoing are the usual kinds of scammony found in commerce. I possess four other varieties:—

α. *Factitious Scammony.* (*Scammonium Smyrnense factitium*, Gray).—I bought this as *Smyrna Scammony*, under which name I formerly described it (*Lond. Med. Gaz.* vol. xx. p. 931). It is in circular flat cakes, about half an inch thick. It is blackish, and has, externally, a slaty appearance; it breaks with difficulty; its fracture is dull and black. Its sp. gr. is 1·412. Moistened and rubbed it evolves the smell of guaiacum. Boiled with water it yields a turbid liquor (which is not rendered blue by iodine), and deposits a blackish powder: the latter, boiled with alcohol, yields a solution which becomes greenish-blue on the addition of nitric acid, showing the presence of guaiacum.

β. *Indian Scammony.*—From my friend, Dr. Royle, I have received a sample of scammony met with in the Indian bazaars. It is light, porous, of a greenish-grey colour; gritty under the teeth, as if containing a considerable quantity of sand, and having a balsamic olibanum-like odour.

γ. *Trebizon Scammony* (?).—In 1832 a substance was imported from Trebizon, under the name of scammony, which was unsaleable here. The sample I received of it is a portion of cake apparently round, flat below, and convex above. Its colour is light-greyish or reddish-brown: when moistened the surface becomes glutinous and odorous; its taste is sweet, nauseous, and somewhat bitter. In its external appearance it has more resemblance to benzoin than scammony.

δ. *French* or *Montpellier Scammony.*—This is the produce of *Cynanchum monspeliacum.* (See ASCLEPIADACÆ.)

COMMERCE.—In 1839 the quantity of scammony on which duty (2s. 6d. per lb.) was paid, amounted to 8,551 lbs.

COMPOSITION. (*a.*) *Of the root.*—The dried root of Convolvulus Scammonia was analyzed, in 1837, by Marquart (*Pharm. Central-Blatt für* 1837, S. 687), who obtained from it the following substances:—*Resin* 4·12, *sugar*, *convolvulin*, and *extractive* 13·68, *resin and wax* 0·55, *gum* 5·8, *extractive* 2·4, *starch* 7·0, *extractive* soluble in hot, but not in cold, water 1·4 [*salts* and *woody fibre* 63·05]. The resin, the wax, and a portion of the gum, are contained in the milky juice of the latex vessels (*vasa laticis*); while the sugar, gum, extractive, and salts dissolved in water, constitute the juice of the cells; and in this juice the starch globules float.

1. *Resin.*—This is analogous to that of the scammony of commerce.
2. *Convolvulin.*—A substance supposed by Marquart to be a vegetable alkali. It reacts feebly as a vegetable alkali, and is precipitated from its watery solution by tincture of nutgalls. Marquart thinks it probably exists in jalap.

(*b.*) *Of Scammony.*—Bouillon, Lagrange, and Vogel (*Ann. Chim.* lxxii. p. 69) analyzed two kinds; one called Aleppo, the other Smyrna scammony. Marquart (*op. supra cit.*) analyzed twelve kinds; of these, eight he considers to be the produce of Convolvulus Scammonia, while the remaining four, which he says are in commerce called *Smyrna scammony*, he regards, though without any sufficient proof, as the produce of *Periploca Secamone*, Linn.

Marquart's Analyses.

	In shells. Sp. gr. 1·2.	Irregular pieces. Sp. gr. 1·239.
Resin	81·25	78·5
Wax	0·75	1·5
Extractive	4·50	3·5
Extractive with salts	—	2·0
Gum with salts	3·00	2·0
Starch	—	1·5
Starchy envelopes, bassorin, and gluten	1·75	1·25
Albumen and woody fibre	1·50	3·5
Ferruginous alumina, chalk, and carbonate of magnesia	3·75	2·75
Sulphate of lime	—	—
Sand	3·50	3·5
Aleppo Scammony	100·00	100 0

	Round cakes. Sp. gr. 1·503.
Alpha resin, with traces of wax	5
Beta resin	1
Extractive taken up by alcohol	11
——————— water	18
Gum, with sulphate of lime	20
Mucilage	5
Starch	23
Colouring matter	2
Woody fibre, oxides, extractive, &c.	11
Inorganic salts, silica, &c.	4
Smyrna Scammony	100

Scammony Resin—Is brownish, and in thin layers transparent: when heated it evolves a peculiar, not disagreeable, odour; it is fusible and combustible. It is soluble in alcohol, ether, and oil of turpentine. Its alcoholic solution is feebly acid; the addition of water causes a white precipitate (*hydrate of resin*). Precipitates (*metallic scammoniates?*) are also produced by alcoholic solutions of the acetate of lead and acetate of copper. Iodic acid causes a white precipitate. Caustic potash deepens the solution (Marquart, *op. cit.*) Scammony resin may be decolorized by animal charcoal, without having its purgative qualities affected (*Journ. de Pharm.* t. xiii. p. 589).

Physiological Effects. (*a.*) *On animals generally.*—The experiments of Orfila (*Toxicol. Gén.*) lead us to infer that scammony is not poisonous. "We have," says he, "frequently administered four drachms of it to dogs who had the œsophagus afterwards tied, and have only observed alvine evacuations." On horses and other herbivorous animals its operation is very uncertain. Gilbert, (Miroud, *Pharm. Vét.* p. 271) states, that six drachms killed a sheep in twenty days, without having caused purging. Viborg (Wibmer, *Wirk. d. Arzn. u. Gifte*, Bd. ii. S. 181) says, half an ounce given to a dog caused several loose stools: the same dose had no effect on a badger. It is probable, however, that in all the experiments now referred to, adulterated scammony was employed.

(*b.*) *On man.*—The effects of pure scammony are those of a powerful and drastic purgative. As the greater part of the commercial drug is largely adulterated, practitioners are, I suspect, scarcely acquainted with the operation of the genuine article, which appears to me to possess nearly double the activity of that usually found in commerce. As the evacuant powers of scammony depend on its local irritation, it operates more energetically when there is a deficiency of intestinal mucus, and is then very apt to gripe; and *vice versâ* when the intestines are well lined with secretion, it passes through with much less effect. In its operation scammony is closely allied to jalap, than which it is more active, while its odour and taste are less nauseous. It is less irritant than gamboge.

Uses.—Scammony is, of course, inadmissible in inflammatory conditions of the alimentary canal, on account of its irritant qualities. It is well adapted for torpid and inactive conditions of the abdominal organs, accompanied with much slimy mucus in the intestines. It is principally valuable as a smart purgative for children, on account of the smallness of the dose necessary to produce the effect, the slight taste, and the energy, yet safety, of its operation. When used for them, it is generally associated with calomel. Where a milder purgative is required, it may be conjoined with rhubarb, sulphate of potash, and an aromatic. It may be employed to open the bowels in cases of constipation; to expel worms, especially of children; to act as a hydragogue purgative, on the principle of counter-irritation, as in affections of the head and dropsies; and for any other purposes for which an active cathartic may be required.

Administration.—For an adult the usual dose of commercial scammony is ten or fifteen grs.; but of virgin scammony from five to ten grs. In order to diminish its irritant and griping qualities, it should be finely divided. For this purpose it may be intimately mixed with some bland powder (as gum, starch, sugar, &c.), or made into an emulsion with milk.

1. *Pulvis Scammonii compositus*, L. D. (Scammony; Hard Extract of Jalap, of each ℥ij.; Ginger, ℥ss. Rub them separately to very fine powder; then mix them).—The effects of scammony and of extract of jalap being very similar, little or no advantage can be obtained by the intermixture of these substances. The ginger is intended to correct the griping of the other ingredients. Compound powder of scammony is cathartic, and is used as a smart purge for children, especially where much mucous slime is contained in the bowels, and in worm cases. The dose for an adult is from grs. x. to ℈j.; for children under a twelvemonth old, from grs. iii. to grs. v. The efficacy of this compound, in the diseases of children, is much increased by the addition of about one grain of calomel to five grains of the above powder.

2. *Pulvis Scammonii compositus*, E. (Scammony; Bitartrate of potash, of each equal parts. Triturate them together to a very fine powder).—This compound, with the addition of diaphoretic antimony, constitutes the old *Cornachini*, or *Earl of Warwick's powder* (*pulvis Cornachini* sive *pulvis Comitis Warvicensis* of Quincey's *Dispensatory*). The bitartrate of potash can do little more than serve to divide the scammony. This preparation is cathartic. The dose for an adult is from grs. xv. to ʒss. By the addition of calomel (in the proportion of one to five parts), we have an imitation of the *royal powder*, or *pulvis basilicus* (Quincey).

3. *Confectio Scammonii*, L. *Electuarium Scammonii*, D. (Scammony, powdered, ℥iss.; Cloves, bruised; Ginger, powdered, each ʒvj.; Oil of Caraway, fʒss.; Syrup of Roses, as much as may be sufficient. Rub the dry ingredients together to very fine powder, and preserve them; then, whenever the Confection is to be used, the syrup being gradually poured in, rub again; lastly, the oil of Caraway being added, mix them all, *L.* The *Dublin College* orders the syrup to be dropped on the powders, the oil of Caraway then added, and all mixed together).—A warm or aromatic cathartic. Dose for an adult, ℈j. to ʒj.; for children, grs. iii. to grs. x. It is seldom employed.

4. *Extractum sive Resina Scammonii*, E. (Take any convenient quantity of Scammony in fine powder; boil it in successive portions of proof spirit till the spirit ceases to dissolve any thing; filter; distil the liquid till little but water passes over. Then pour away the watery solution from the resin at the bottom; agitate the resin with the successive

portions of boiling water till it is well washed; and, lastly, dry it at a temperature not exceeding 240°).—When pure or virgin scammony can be obtained, this preparation is quite unnecessary. Scammony resin is a drastic cathartic: dose, grs. v. to grs. x. When administered it should be intimately divided, either by some bland powder, or still better by an emulsion.

5. *Mistura Scammonii*, E. (Resin of Scammony, gr. vij.; Unskimmed Milk, f℥iij. Triturate the resin with a little of the milk, and gradually with the rest of it till a uniform emulsion is formed).—This is an imitation of Planche's *purgative potion*, except that two drachms of sugar and three or four drops of cherry-laurel water are omitted. It is one of the most agreeable purgative draughts that can be taken.

Ipomæ'a Pur'ga, Wenderoth, E.—*The Jalap Ipomœa.*

Ipomæa Jalapa, *Nuttall*, *L.*—I. Schiedeana, *Zuccarini.*

Sex. Syst. Pentandria, Monogynia.

(Radix, *L. D.*—Root, *E.*)

History.—De Paiva (Voigtel's *Arzneimittell.* Bd. i. S. 117) thinks that jalap was known to Dodoens in 1552, to Monardes in 1568, and to Cluvius in 1574. (See some remarks on this subject in *Pharm. Central-Blatt. für* 1834, S. 955-6). But Bauhin (who calls it *Bryonia Mechoacana nigricans; Prodromus*, p. 135) says it was brought from India, under the name of *Chelapa*, or *Celapa*, about eleven years before the time he wrote (the date of the preface to his work is 1620): that is, about 1609 or 1610. Its name seems to be derived from Xalapa, a town of Mexico.

The *Convolvulus Jalapa* described and figured by Woodville (*Med. Bot.* p. 59) and Desfontaines (*Ann. Mus. d'Hist. Nat.* t. ij.), and adopted by the *Dublin College* as the source of the commercial jalap, is now well known to yield none of this drug. The real jalap plant was first described by Mr. Nuttall (*American Journ. of Med. Sciences for Feb.* 1830); but the name (*Ipomœa Jalapa*) he gave to it had been already applied by Pursh to another plant. In the same year Dr. Schiede (*Linnæa*, v. 3, Juli, 1830, p. 473) and Dr. Wenderoth (*Ibid.* viii. 515) noticed it; and in 1832 it was described and figured by Zuccarini (*Acta Acad. Reg. Monacensis*, vol. x.)

Botany. *Gen. Char.*—*Sepals* five. *Corolla* campanulate. *Stamens* included. *Style* one. *Stigma* two-lobed; the lobes capitate. *Ovary* two-celled; cells two-seeded. *Capsule* two-celled (Lindley).

Sp. Char.—*Root* tuberose; incrassated, perennial. *Stems* annual, twining, branched, smooth. *Leaves* ovate, acuminate, cordate at the base, quite entire, and smooth on both sides. *Peduncles* one- to three-flowered. *Sepals* unequal, obtuse, smooth. *Corolla* salver-shaped, with a subclavate, cylindrical tube, and a subpentagonal, horizontally-expanded limb. *Stamina* exserted (Zuccarini).

Root perennial, tuberose, irregularly ovate-conical, terminating inferiorly in some subcylindrical fibrous branches; covered by a very thin dirty, blackish epidermis; internally white and fleshy. *Stem* herbaceous. *Leaves* alternate, petioled. Tube of the *corolla* purplish violet (red lake).

Hab.—In the woods of the Mexican empire, near Chicanquiaco, at an elevation of nearly 6,000 feet above the level of the sea. Jalapa is the only market for the root, from whence it is exported to Europe by way of Vera Cruz.

Description.—The dried tubers (*radix jalapæ*) found in commerce rarely exceed a pound each in weight. They vary in size, from that of the fist to that of a nut. When entire they are usually more or less oval, and pointed at the two opposite extremities. The larger tubers are frequently incised, apparently to facilitate desiccation. They are covered with a thin, brown, wrinkled cuticle. They should be heavy, hard, and difficult to powder. When broken, good tubers present a deep yellowish-gray colour, interspersed with deep brown concentric circles. The slices vary in their shape, colour, and other properties. Those of inferior quality are light, *whitish*, and friable; they usually appear to be quarter segments of transverse slices: they are called *spurious jalap*, or, from their shape, *cocked-hat jalap*. The *light* or *fusiform jalap*, called in Mexico *male jalap*, described by Guibourt (*Hist. des Drog.* i. 523), is said to be the produce of *Ipomœa Orizabensis* (Pelletan, *Journ. de Chim. Méd.* t. x. p. 10). Jalap is very apt to become worm-eaten; but the insects which attack it, devour the amylaceous matter, and leave the resin. Hence *worm-eaten jalap* is well adapted for the preparation of extract.

Commerce.—Jalap is imported, in bales, from Vera Cruz direct, or indirectly by way of New York, or other places. In 1839, duty (6d. per lb.) was paid on 37,211 lbs.

Composition.—Jalap was analyzed, in 1817, by Cadet de Gassicourt (*Journ. de Pharm.* t. iii. p. 495), and more recently by Gerber (Gmelin, *Handb. d. Chemie*, Bd. ii. S. 1299). Other less complete analyses have been made by Henry (*Bull. de Pharm.* t. ii. p. 87), by Ledanois (*Journ. de Chim. Méd.* t. v. p. 508), and by Nees v. Esenbeck and Marquart (*Ph. Cent.-Blatt für* 1834, S. 695). In 1835 Cannobio analyzed a variety of jalap called *gialappone* (*Ibid. für* 1835, S. 304).

Gerber's Analysis.

Hard resin	7·8
Soft resin	3·2
Slightly acrid extractive	17·9
Gummy extractive	14·4
Colouring matter	8·2
Uncrystallizable sugar	1·9
Gum, with some salts	15·6
Bassorin	3·2
Vegetable albumen	3·9
Starch	6·0
Water	4·8
Malic acid and malates of potash and lime	2·4
Chlorides of calcium and potassium	1·4
Phosphates of magnesia and lime	1·7
Carbonate (?) of lime	3·0
Loss	4·6
Jalap	100·0

Henry's Analysis.

	Light.	Sound.	Worm-eaten.
Resin	12	9·6	14·4
Extractive	15	28·0	25·0
Starch	19	20·4	20·6
Woody fibre	54	42·0	40·0
Jalap	100	100·0	100·0

Nees v. Esenbeck and Marquart's Analysis.

	Root of *Ipomœa Purga.*	Commercial Jalap.	False Jalap.
Extractive	20·416	27·50	6·66
Resin	12·083	13·33	18·33
Matters insoluble in alcohol	67·500	59·16	75·00
	100·000	100·00	100·00

Jalap Resin.—Obtained by mixing the alcoholic tincture (prepared by percolation or digestion) of jalap with water. The precipitated resin is to be washed with warm water, and then dissolved in alcohol. By evaporation the tincture yields the resin.

Planche (Soubeiran, *Traité de Pharm.* t. ii. p. 28) has proposed another process. By digestion with animal charcoal the alcoholic solution of the resin is rendered nearly colourless, and by evaporation yields an almost colourlêss resin (*resina jalapæ alba* of Martius, *Pharm. Cent.-Blatt für* 1835, S. 557). Jalap resin is soluble in alcohol, but insoluble in water. Triturated with milk, it does not form an emulsion, but its particles unite into a solid mass. By this it may be distinguished from scammony resin (Planch, *Journ. de Pharm.* t. xviii. p. 181-5). It is insoluble in the fixed and volatile oils. Its insolubility in oil of turpentine is a means of detecting the intermixture of some other resins, as of rosin (*Pharm. Cent.-Blatt für* 1832, S. 837; and *für* 1838, S. 904). Decolorized jalap resin is composed of *Carbon* 36·62, *Hydrogen* 9·47, and *Oxygen* 53·91 (Goebel, *Pharm. Waarenk.* Bd. ii. S. 59).

According to Buchner and Herberger (*Pharm. Cent.-Blatt für* 1831, S. 284), jalap resin is composed of an electropositive basic substance, which they term *jalapin*, and of an electronegative, resinous acid, soluble in alkalies. The latter I shall call *jalapic acid.*

α. Jalapin.—Constitutes not quite nine-tenths of jalap resin. When an alcoholic solution of acetate of lead is added to an alcoholic solution of jalap resin, double decomposition occurs: acetate of jalapin remains in solution, while jalapate of lead precipitates. When the solution has been deprived of acetic acid, excess of lead, and alcohol, the jalapin remains. It is a transparent, colourless resin; very soluble in alcohol, but insoluble in ether.—Is this the jalapin of Mr. Hume (*Med. and Phys. Journ.* for April, 1824, p. 346)?

β. Jalapic acid.—Constitutes thirteen one-hundredths of jalap resin. Obtained from the above-mentioned jalapate of lead by sulphuretted hydrogen. It is brown, acrid, bitterish, slightly soluble in ether, and more soluble in alkalies than jalapin.

PHYSIOLOGICAL EFFECTS. (*a.*) *On animals generally.*—Jalap root in powder, as well as the resin obtained from it, is a local irritant. Its operation on the bowels is well seen in the *carnivora*. Cadet de Gassicourt (Wibmer, *Wirk. d. Arzn. ü. Gifte*, Bd. iii. S. 181) found that the resin applied to the pleura, peritoneum, or intestinal canal of dogs, caused fatal inflammation. Two drachms introduced into the stomach, the œsophagus being afterwards tied, killed a dog in a few hours. It is remarkable, however, that the same experimenter observed no particular effect from the application of a drachm of the fine-powdered resin to the cellular tissue of the back. Moreover, 24 grains, with the yelk of an egg, injected into the jugular vein, had, he says, a very slight effect; indeed, at first none was observed, but the two following days the animal had soft, pale evacuations, and lost his appetite, though he soon recovered from this state. In the *herbivora* it proves a very uncertain purgative. Gilbert (Moiroud, *Pharm. Vét.* p. 269) gave two ounces to a sheep, without observing any effect. Donné (*Ibid.*) administered two or three ounces to horses, without observing any remarkable effect, except increased secretion of urine.

(*b.*) *On man.*—In the human subject jalap acts as a powerful and drastic purgative, producing copious liquid stools, and when judiciously exhibited, is both safe and efficacious. Its objectionable effects are, that while in the stomach it causes frequently nausea, and sometimes vomiting; while, after it has passed into the intestines, it oftentimes gripes.

It is tolerably certain in its operation; more so, indeed, than many other purgatives. In the proper dose it may be given without the least hesitation to children, in any case requiring an active purge. It has an advantage over some other evacuants, that it does not stimulate or heat the system, its effects being confined, principally, to the alimentary canal —the peristaltic motion, secretions, and exhalations of which it promotes; and it is said that constipation less frequently succeeds its use than of some other purgatives.

My own experience of jalap would lead me to regard it as a perfectly safe, though active cathartic. But Dr. Christion (*On Poisons*, p. 554) says, that " severe and even dangerous effects have followed its incautious use in the hands of the practical joker." I am not acquainted with any cases, in the human subject, in which its employment has been followed by serious consequences. It is a more drastic purgative than senna. To scammony it is closely allied, not only by its effects, but also by botanical affinities and chemical properties. It is much less irritant to the intestinal mucous membrane than gamboge; and therefore is a much safer purgative. Vogt (*Pharmakodyn.* Bd. ii. S. 230, 2te Aufl.) regards it as exceeding the last-mentioned substance, but as being inferior to aloes, in its stimulant influence over the abdominal and pelvic blood-vessels: and Sundelin (*Handb. d. spec. Heilmittell.* Bd. ii. S. 26, 3te Aufl.) observes, that while it is more irritant, it is less heating, than aloes or senna.

Uses.—Daily experience proves the value of jalap, as an active purgative, in various diseases both of children and adults. Of course its irritant properties unfit it for exhibition in inflammatory affections of the alimentary canal, as well as after surgical operations about the abdomen and pelvis. Moreover, it is not an appropriate purgative in irritation of, or hemorrhage from, the uterus; or in piles and stricture, and prolapsus of the rectum. On the other hand, its use is indicated in torpid and overloaded conditions of the intestinal canal, as well as in constipation, attended with retention of the catamenia. When the object is to relieve cerebral congestion and dropsical affections, by a counter-irritant influence on the mucous membrane, jalap is well adapted to fulfil it, both by the energy and safety of its operation. The following are some of the cases in which it is employed.

1. *In Constipation.*—When this condition is not dependent on, or connected with, irritation or inflammation of the alimentary canal or pelvic organs, jalap is admissible. Its efficiency is much increased by association with calomel. It may be employed in febrile and inflammatory diseases (those above-mentioned excepted), as well as in chronic maladies.

2. *As a Vermifuge.*—The compound of jalap and calomel is a most efficacious anthelmintic, and may be used with the most happy effects in children, especially where there is an excessive secretion of mucus. " Jalap," says Bremser (*Traité sur les Vers Intest.* p. 440), " is, without contradiction, in verminous diseases, one of the best purgatives, and which, perhaps, possesses, at the same time, greater anthelmintic virtues than any others."

3. *In Cerebral Affections.*—Jalap, in combination with calomel, is used with the best effect, on the principle of counter-irritation, to relieve cerebral congestion. In inflammatory affections of the brain or its membranes, or in hydrocephalus, it is a valuable purgative.

4. *In Dropsies.*—In dropsical affections it is frequently desirable to promote watery stools. Jalap, especially in combination with cream of tartar, may be used for this purpose with the best effects. Marggrave (*Mat. Med. contr.* p. 40, ed. 2nda) calls it a *panacea hydropicorum.*

5. *In Retention of the Catamenia, or of the Hemorrhoidal flux*, jalap is one of the purgatives adapted, from their stimulant influence over the pelvic vessels, to promote these discharges.

Administration.—The dose of jalap, *in powder*, is, for an adult, from ten to thirty grains: a scruple usually acts smartly and safely: for children under twelve months old, the dose is from two to five grains. Fifteen grains of jalap and two or three grains of calomel, is an efficient, yet safe, purgative for an adult. From two to five grains of ipecacuanha is sometimes substituted for the calomel.

1. *Pulvis Jalapæ compositus*, L. E. D. (Jalap, ℥iij.; Bitartrate of Potash, ℥vj.; Ginger, ʒij. Rub them separately to powder; then mix them, *L.* The *Edinburgh* and *Dublin Colleges* use the same proportions of jalap and bitartrate of potash, but omit the ginger).—Hydragogue purgative. Used in habitual costiveness, verminous diseases, and dropsies. Dose, for an adult, ℈j. to ʒj.

2. *Tinctura Jalapæ*, L. E. D. (Jalap, bruised, ℥x. [in moderately fine powder, ℥iij., *E.*]; Proof Spirit, Oij. [f℥xviij., *E.*] Macerate for fourteen days, and strain, *L. D.* "This tincture may be prepared either by digestion or percolation, as directed for tincture of cinchona," *E.*)—An active cathartic. Rarely used alone: generally employed as an adjunct to purgative draughts, the activity of which it promotes. Dose, fʒj. to fʒiv. As an adjuvant to a cathartic draught, the dose rarely exceeds f℥ij.

3. *Extractum Jalapæ*, L. D. *Extractum* sive *Resina Jalapæ*, E. (Jalap root, powdered, lbiiss. [lbj. *D.*]; Rectified Spirit, *Cong.* j. [Oiv. wine measure, *D.*]; Distilled water, *Cong.* ij. [*Cong.* j. *D.*]. Macerate the jalap root in the spirit for four days, and pour off the tincture. Boil down the residue in the water to half a gallon [two pints, *D.*]; afterwards strain the tincture and the decoction separately, and let the latter be evaporated, and the former distil, until each thickens. Lastly, mix the extract with the resin, and [by a water-bath, *D.*] evaporate to a proper consistence, *L. D.* This extract should be kept *soft*, which may be fit to form pills, and *hard*, which may be rubbed to powder, *L.* The directions of the *Edinburgh College* are the following:—"Take any convenient quantity of jalap, in moderately fine powder; mix it thoroughly with enough of the rectified spirit to moisten it well; put it in twelve hours into a percolator, and exhaust the powder with rectified spirit; distil off the greater part of the spirit, and concentrate the residuum over the vapour-bath to a due consistence.")— In this process the alcohol extracts the resin, and the water subsequently used by the London and Dublin Colleges takes up the gummy extractive: the alcoholic tincture is distilled to save the spirit, while the aqueous decoction is evaporated. The preparation of the *Edinburgh College* is the impure resin of jalap; whereas that of the *London* and *Dublin Colleges* is a mixture of resin with the gummy extractive. It was formerly, and indeed is now by many persons, supposed, that the combination of these ingredients was necessary for the full cathartic effect of jalap. It is, however, well known, that the watery extract is inert as a purgative, though it is said to be diuretic: the only advantage, therefore, that can attend the mixture of the two extracts (the watery and the alcoholic), is, that the resin is intimately divided, and thereby prevented from causing violent irritation and griping in any one part of the intestinal tube. But it is obvious that the same advantage can be obtained by mixing the resin with some mild agent (as almonds, sugar or saline matter, as sulphate of potash). Mr. Brande (*Dict. Mat. Med.* p. 331) says,

that jalap yields about 66 *per cent.* of extract; that is, 16 of alcoholic, and 50 of water extract. According to this statement, therefore, the extract of the Edinburgh College possesses four times the activity of that of the London and Dublin Colleges. The dose of the *resin* (Ph. Ed.) is from grs. iij. to grs. vj., in a minute state of division, as above directed; of the extract *Ph. L.* and *D.*, from grs. x. to ℈j.

Other Medicinal Convolvulaceæ.

Besides the species already noticed, the roots of several others have been employed in medicine on account of their purgative properties; as the root called *Mechoacan*, and the root of *Ipomæ'a Turpe'thum.* Their use is now obsolete.

Order 38. Gentiana'ceæ, *Lindley.*—The Gentian Tribe.

Gentianeæ, *Jussieu.*

Essential Character.—*Calyx* monophyllous, divided, inferior, persistent. *Corolla* monopetalous, hypogynous, usually regular and persistent; the limb divided, equal, its lobes of the same number as those of the calyx, generally five, sometimes four, six, eight, or ten; with an imbricated twisted æstivation. *Stamens* inserted upon the corolla; all in the same line, equal in number to the segments, and alternate with them; some of them occasionally abortive. *Pollen* three-lobed or triple. *Ovary* single, one- or two-celled, many-seeded. *Style* one, continuous; *stigmas* one or two. *Capsule* or *berry*, many-seeded, with one or two cells, generally two-valved; the margins of the valves turned inwards, and in the genera with one cell, bearing the seeds; in the two-celled genera inserted into a central placenta. *Seeds* small; *testa* single; *embryo* straight in the axis of soft fleshy *albumen; radicle* next the hilum. *Herbaceous* plants, seldom *shrubs*, generally smooth. *Leaves* opposite, entire, without stipules, sessile, or having their petioles confluent in a little sheath, in most cases three- to five-ribbed; very rarely brown and scale-like; sometimes alternate. *Flowers* terminal or axillary (Lindley).

Properties.—This order contains a bitter principle, which is especially abundant in the roots. On this substance depends the stomachic, tonic, and febrifuge properties of the different species.

Gentia'na lu'tea, Linn. L. E. D.—*Common* or *Yellow Gentian.*

Sex. Syst. Pentandria, Digynia.

(Radix, *L. D.*—Root, *E.*)

History.—Gentian is said to owe its name and introduction into medical use to Gentius, king of Illyria, who was vanquished by the Romans about 160 or 169 years before Christ. It is, therefore, not noticed by either Hippocrates or Theophrastus, but is mentioned by Dioscorides (lib. iii. cap. 3), who calls it Γεντιανὴ; and by Pliny (*Hist. Nat.* lib. xxv. cap. 34, ed. Valp.)

Botany. *Gen. Char.*—*Calyx* [four-] five-cleft. *Corolla* tubular, campanulate, or funnel-shaped at the base; the limb four-, five, or six-cleft; segments entire or ciliated, sometimes with interposed, distinct smaller ones. *Stamina* five, inserted on the tube of the corolla; anthers sometimes connate. *Style* two-parted; *stigmas* two. *Capsule* one-celled (*Bot. Gall.*)

Sp. Char.—*Leaves* broad, ovate, nerved. *Flowers* whorled, pedicellate. *Calyx* membranaceous, unilateral. *Corolla* rotate, five- to eight-cleft, acute (*Bot. Gall.*)

Root perennial, cylindrical or spindle-shaped, simple or somewhat branched, ringed, wrinkled, externally brown, internally yellow and fleshy. *Stem* simple, erect, two to three feet high, roundish, hollow, smooth. *Leaves* pale-green, opposite, ovate or oval, pointed, entire, smooth, five- to seven-ribbed, plaited; lower ones on short, sheathing petioles; upper ones amplexicaul; those next the flowers becoming concave, yellowish-green *bracts*. *Flowers* on smooth peduncles of four- to six-lines long. *Calyx* yellow. *Corolla* yellow; segments five to seven, lanceolate. *Stamina* as long as the corolla. *Ovarium* conical, with five greenish glands at the base. *Capsule* conical, two-valved. *Seeds* numerous, roundish, albuminous, with membranous margins.

Hab.—Alps of Austria and Switzerland; abundantly on Mount Jura.

Collection.—The roots are collected and dried by the peasants of Switzerland, the Tyrol, Burgogne, and Auvergne. They are imported into this country in bales, from Havre, Marseilles, &c. In 1839, duty (4s. *per cwt.*) was paid on 470 *cwts.*

Description.—Gentian root (*radix gentianæ*) is imported in cylindrical usually more or less branched pieces, varying in length from a few inches to a foot or more, and in thickness from half an inch to one or two inches. These pieces are marked by transverse annular wrinkles and longitudinal furrows. Externally the root is yellowish-brown, internally it is brownish-yellow; its texture is spongy; its odour, in the fresh state, peculiar and disagreeable; its taste is intensely bitter. The roots of other species of Gentiana are said to be frequently mixed with those of the officinal species; their effects, however, are analogous. Martius (*Pharmakogn.*) says, that the roots of *G. purpurea* have strong longitudinal furrows, and are of a darker brown colour internally, but want the transverse wrinkles. The roots of *G. pannonica* are similar to those of *purpurea*. Both kinds are met with in Bavaria, and serve in Switzerland for the preparation of a spirit. *Gentiana punctata* has roots which are just as bitter, but of a more yellow colour: they are dug up in great abundance in Moravia. The roots of both the last-mentioned species are dug up at, and exported from, Salzburg: in the fresh state they are white when sliced.

Chemistry.—Gentian root was analyzed, in 1815, by Schrader (Trommsdorf's *N. Journ.* Bd. iii. S. 281); in 1817 by Braconnot (*Journ. de Physiq.* lxxxiv. 345); in 1819 by Henry (*Journ. de Pharm.* t. v. p. 97); in the same year by Guillemin and Fœcquemin (*Ibid.* p. 110); in 1821 by Henry and Caventou (*Ibid.* t. vii. p. 173). In 1837 it was examined by Leconte (*Ibid.* t. xxiii. p. 465). The constituents of gentian root, according to Henry and Caventou, are—*a volatile odorous matter, bitter crystalline matter* (*gentianin*), *fugaceous odorous principle* (*volatile oil?*), *yellow colouring matter, green fixed oil, gum, incrystallizable sugar, matter identical with bird-lime, a free organic acid*, and *woody fibre.* But in 1837, H. Trommsdorf (*Berlin Jahrbuch*, Bd. xxxvii. S. 182), and Leconte (*op. supra cit.*) showed, that under the name of gentianin two substances had been confounded,—the one crystalline and tasteless; the other bitter. The first has been called *gentisin*; the second *gentianite.* Furthermore, Leconte has shown, that the substance considered by Henry and Caventou as identical with bird-lime, is a compound of *wax, oil*, and *caoutchouc.*

1. *Volatile Odorous Principle of Gentian.*—The nature of this principle is scarcely known. Planche, *Bull. de Pharm*, t. vi. p. 551) says, the distilled water of gentian causes

nausea and a kind of intoxication. Leconte found it to be possessed of a strong smell, and a piquant taste.

2. *Gentisin* or *Gentisic Acid.*—Procured by washing the alcoholic extract of the root with water, and then treating with alcohol. The tincture obtained was evaporated, the extract treated by ether: the residue, by successive solutions and evaporations, yielded gentisin. It is pale-yellow, crystallizable in needles, has a peculiar, but weak smell. When cautiously heated, it gives out some yellow vapours, which are condensed on the upper part of the tube. It is scarcely soluble in water, but dissolves in alcohol. With alkalies it unites to form salts. Its saturating power is about 438. Trommsdorf says, that a solution of gentisic acid is unaffected by acetate of lead, nitrate of silver, and most other tests. Chloride of iron and the salts of copper produced, in the alcoholic solution, the most characteristic changes.

3. *Bitter Principle of Gentian* (*Gentianite*).—This has not hitherto been isolated. By digesting the alcoholic extract of gentian in water, an acidulous intensely bitter solution is obtained. The acid may be thrown down by lead. When the excess of lead has been removed from the solution by sulphuretted hydrogen, a liquid is obtained, which, by evaporation, yields a sweet and very bitter extract, from which ether removes an aromatic fat, an odorous resin, and wax. The bitter matter has not been separated from the sugar.

4. *Pectin.*—The existence of pectic acid (pectin) in gentian was ascertained, in 1836, by Denis (*Journ. de Pharm.* t. xxii. p. 303). To this substance is to be ascribed the gelatinization of infusion of gentian, which, under certain circumstances, is not unfrequently observed.

5. *Sugar.*—To the presence of this matter in gentian is to be ascribed the capability of the infusion of gentian to undergo the vinous fermentation, and to form an alcoholic liquor (*gentian spirit*), much admired by the Swiss (Biwald, in Pfaff's *Mat. Med.* Bd. ii. S. 29; and Planche, *Bull de Pharm.* vi. 551.)

Chemical Characteristics.—The infusion of gentian is deepened in colour by the caustic alkalies. Sesquichloride of iron communicates a deep olive-brown tint. The acetates and diacetates of lead, the sulphates of copper, and the nitrate of mercury, cause flocculent or gelatinous precipitates (*metallic pectates?*).

Physiological Effects.—Gentian is very properly regarded as a *pure or simple bitter*; that is, as being bitter, but without possessing either astringency or much aroma. It has, therefore, the usual tonic properties of medicines of this class, and which I have before noticed (p. 79).

Given in full doses it appears more disposed to relax the bowels than the other simple bitters, and in susceptible individuals it is more apt to disorder the digestive process. In such cases both Löseke and Voigtel (*Arzneimittell.* Bd. ii. S. 359) have seen it cause vomiting. Barbier (*Mat. Méd.*) says it quickens the pulse. It is somewhat less bitter, and, therefore, I presume, somewhat less powerful than quassia.

By continued use the sweat and urine acquire a bitter taste (Arnemann, *Prakt. Arzneimittell.* S. 188, 6te Aufl.); a sufficient proof that gentian, or its bitter principle, becomes absorbed.

As some of the vegetable bitter tonics (for example, quassia and calumba) have been found to exert a specific influence over the cerebro-spinal system, and to yield preparations of a poisonous quality, we are naturally led to inquire whether any analogous facts have been made out with respect to gentian. The reply is in the affirmative. Magendie (*Formul.* p. 313, 8me éd.), indeed, discovered no poisonous operation in *Gentianin*; he threw several grains of this principle into the veins of an animal, without any obvious effect; and swallowed two grains dissolved in alcohol, but only observed extreme bitterness, and a slight feeling of heat in the stomach. Moreover, Hartl (quoted by Wibmer, *Wirk. d.*

Arzneim. ü. Gifte, Bd. ii. S. 398) inserted two grains of the extract of gentian into the inner side of the thigh of a rabbit, without any ill effects resulting: the wound was slightly inflamed, though it soon healed. These facts prove that the bitter extractive of gentian possesses no narcotic properties. But if the narcotic principle of gentian be of a volatile nature, these experiments of Magendie and Hartl go for nothing, since in the preparation of both the extract and the *Gentianin*, this principle would be dissipated by the heat employed. Now, Planche (*op. cit.*) has shown, as I have already mentioned, that the distilled water of gentian causes violent nausea, and, within three minutes, a kind of intoxication. Moreover, Buchner (*Toxikol.* S. 192) tells us, that some years ago a narcotic effect was produced in Prussia by the medicinal use of gentian root, although the presence of any foreign matter could not be detected. In the *Philosophical Transactions* for the year 1748, are mentioned some deleterious effects resulting from the use of gentian; but they were referred to a foreign root, said to have been intermixed, and which greatly resembled the true gentian root.

All these facts, then, support the opinion of Haller (quoted by Buchner), that gentian is not so innocuous as is generally supposed.

Uses.—Gentian is adapted to most of the cases requiring the use of the pure or simple bitters (p. 79). It agrees best with phlegmatic, torpid individuals, and is apt to disagree with irritable or susceptible persons. It is contra-indicated in febrile disorders and inflammatory conditions of the gastro-intestinal membrane. It is employed principally in the following cases:—

1. *In dyspepsia, and other gastric disorders*, attended with debility or torpidity, and unaccompanied by any marks of inflammation or irritation, or great susceptibility of the digestive organs.

2. *In intermittent diseases* it may be used where cinchona is admissible; but it is much inferior to the last-mentioned substance. "Joined with galls or tormentil, in equal parts, and given in sufficient quantity, it has not failed," says Dr. Cullen (*Mat. Med.* vol. ii. p. 72), "in any intermittents in which I have tried it."

3. In many other diseases marked by weakness and debility, but unattended by fever or gastro-intestinal irritation, gentian is admissible and useful. For example, some forms of gout, hysteria, uterine disorders, &c. It is a constituent of the *Duke of Portland's powder for the gout* (see p. 781).

4. *Against worms* it has been used as if it possessed some specific influence.

5. In surgery it has been used for discutient fomentations, in fine powder, to issues, to promote their running, and as a tent, to enlarge and cleanse fistulous apertures (Quincey, *Dispens.*)

Administration.—In the form of *powder*, the dose is from grs. x. to ʒss. But the *infusion*, *tincture*, or *extract*, are the usual forms of exhibition.

1. *Infusum Gentianæ compositum*, L. D. *Infusum Gentianæ*, E. (Gentian root, sliced, ʒij. [ʒj. *D.*]; Orange Peel, dried, ʒij. [ʒj. *D.*]; Lemon Peel, fresh, ʒiv. [ʒj. *D.*]; Boiling [Distilled, *L.*] Water, Oj. [℥xij. *D.*] Macerate for an hour in a vessel lightly covered, and strain. The directions of the *Edinburgh College* are as follow:—Gentian, sliced, ℥ss.; Bitter Orange Peel, dried and bruised, ʒj.; Coriander, bruised, ʒj.;

Proof Spirit, f℥iv.; Cold Water, f℥xvi. Pour the spirit upon the solids; in three hours add the water, and in twelve hours more strain through linen or calico).—The infusion of the London and Dublin Pharmacopœias is very apt to spoil by keeping; but as it can always be speedily procured, this is not a circumstance of much importance. However, to obviate it as much as possible, the Edinburgh College order cold water (by which less of the mucilaginous matter [pectin, &c.] is dissolved), and employ spirit to promote the solution of the bitter principle, while the quantity of gentian is much increased; so that, in fact, we have a weak tincture, rather than an infusion. Besides the objections which may arise out of these deviations, a very important one is the length of time required for the maceration. Infusion of gentian is stomachic and tonic. When prepared according to the London and Dublin Pharmacopœias, the dose is f℥j. to f℥ij.; when according to that of the Edinburgh, f℥ss. to f℥j.

2. *Mistura Gentianæ composita*, L. (Compound Infusion of Gentian, f℥xij.; Compound Infusion of Senna, f℥vj.; Compound Tincture of Cardamoms, f℥ij. Mix.)—Tonic and cathartic. Used in dyspepsia with constipation. Dose, f℥j. to f℥ij.

3. *Tinctura Gentianæ composita*, L. E. D.; *Tinctura amara.* (Gentian, sliced and bruised, ℥iiss.; Orange Peel, dried, ʒx.; Cardamom [seeds], bruised, ʒv.; Proof Spirit, Oij. *L.* The relative proportions used by the *Dublin College* are the same as those of the London. The *Edinburgh College* employ ℥ij. of Gentian; ℥j. of Dried Bitter Orange Peel; ʒss. of Canella, in moderately fine powder; ʒss. of Cochineal, bruised; and f℥xxxvj. of Proof Spirit).—A grateful cordial tonic and stomachic. Employed as an adjunct to the infusion, effervescing draughts, bottle soda-water, &c. Dose, fʒss. to fʒij.

4. *Extractum Gentianæ*, L. E. D. (Gentian, sliced, lb. iiss.; Boiling Distilled Water, *Cong.* ij. Macerate for twenty-four hours; then boil down to a gallon, and strain the liquor while hot; lastly, evaporate to a proper consistence, *L.* "Take of Gentian, any convenient quantity; bruise it to a moderately fine powder; mix it thoroughly with half its weight of distilled water; in twelve hours put it into a proper percolator, and exhaust it by percolation with temperate distilled water; concentrate the liquid, filter before it becomes too thick, and evaporate in the water-bath to a due consistence," *E.*)—Good gentian root yields, by the process of the London Pharmacopœia, about half its weight of extract (Brande, *Dict. Mat. Med.* p. 261). Extract of gentian is tonic. It is usually employed as a vehicle for the exhibition of the metallic substances (especially chalybeates) in the form of pill. Dose, grs. x. to ʒss.

5. *Gentianin.* (See Majendie, *Formul.*)—An expensive and needless preparation. The nature of the substance called gentianin has been before explained (*see* p. 894). Dose, gr. ss. to gr. j.

*** *Volatile Oil of Gentian.* (Obtained by submitting gentian root to distillation with water. From three cwts. of root only fʒss. of oil was procured).—It is thick, of a blackish dark-green colour, and has a very powerful odour of gentian root. It swims on water, and dissolves in rectified spirit. A few drops were given to a rabbit, without causing any remarkable effects.—This oil has only been procured since the first part of the article on gentian was struck off.

Agatho'tes Chiray'ta, Don. E.—*The Chiretta* or *Chirayta.*

Gentiana Chirayita, *Fleming.*

Sex. Syst. Pentandria, Digynia.

(Herb and Root, *E.*)

History.—This plant seems to have been long in use among the natives of India. Professor Guibourt (*Journ. de Chim. Méd.* t. i. p. 229) thinks that it is the κάλαμος ἀρωματικὸς of Dioscorides (lib. i. cap. 17). Various circumstances, however, appear to me to be opposed to this opinion: one of the most conclusive is the absence of odour in the chirayta plant (Fée, *Cours d'Hist. Nat.* t. ii. p. 395). I have before stated (p. 609) that Professor Royle refers the *Calamus aromaticus* of the Greeks to his *Andropogon Calamus aromaticus* (*A. nardoides*, Nees ab Esenb.)

Botany. *Gen. Char.*—*Corolla* withering, rotate, in æstivation twisted to the right; with glandular hollows protected by a fringed scale upon the segments. *Anthers* not changing. *Stigmas* sessile. *Capsule* conical, one-celled, with spongy placentæ upon the sutures. *Seeds* indefinite, minute (Lindley).

Sp. Char.—*Stem* round. *Leaves* ovate-lanceolate. *Hollows* of the corolla nectariferous, oblong, distinct. *Squamulæ* capillaceo-fimbriate at the margin (Don, *Trans. of the Linn. Soc.* vol. xvii. p. 522).

Herbaceous. Root branching. *Stem* round, smooth, jointed. *Leaves* opposite, amplexicaul, lanceolate, very acute, entire, smooth, three- or five-nerved. *Flowers* numerous, peduncled. *Calyx* four-cleft; divisions linear, acute. *Corolla* yellow; limb four-parted.

Hab.—Mountains of Nepal and the Morungs.

Description.—The plant is pulled up by the root, about the time that the flowers begin to decay and the capsules are well formed (Roxburgh, *Fl. Hist.* vol. ii. p. 72). The dried plant, with the root (*herba et radix chirettæ* sive *chiraytæ*) is met with in the shops. The root is fibrous; the stem is round, smooth, not jointed, marked with the cicatrices of leaves, has a yellowish pith; the leaves are as above described. The whole plant is without odour, but has an intensely bitter taste.

Composition.—The stems of this plant were analysed by MM. Lassaigne and Boissel (*Journ. Pharm.* vol. vii. p. 283), who obtained the following results:—*resin, yellow bitter matter, brown colouring matter, gum, malic acid* [*woody fibre*], *malate of potash, chloride of potassium, sulphate of potash, phosphate of lime, silica,* and *traces of oxide of iron.*

The *bitter matter* is the most important constituent. No vegetable alkali has been detected in it. The substance sold as *sulphate of chirayitine* is sulphate of quinia (*Lond. Med. Gaz.* vol. xxi. p. 173).

Physiological Effects.—Chirayta is an intensely bitter substance, and produces the before (p. 79) described effects of the *simple* or *pure bitters.* In its operation, as well as by its botanical affinities, it is closely allied to gentian. It appears to possess rather a relaxing than a constipating effect (Baker, *Lond. Med. Gaz.* vol. ii. p. 685).

Uses.—It has long been employed by the natives of India in the same class of cases in which gentian has been used in Europe. As a stomachic it is especially serviceable in the dyspepsia of gouty subjects. It strengthens the stomach, obviates flatulency, and diminishes the tendency to acidity (Fleming, *Asiat. Researches*, vol. xi. p. 167). Combined with the seeds of *Guilandina Bonduc*, it is employed with success in intermittents (Johnson, *Infl. of Trop. Climates*, p. 58, 3rd ed.)

Administration.—It may be given in *powder*, in the dose of a ℈j., or it may be employed in the form of *infusion, tincture* (prepared with cardamom and orange peel, like *compound tincture of gentian*) or *extract.*

Infusum Chirettæ, E. (Chiretta, ʒiv.; Boiling Water, Oj. Infuse for two hours, and strain through linen or calico).—The dose of this is ℥j. to f℥ij.

Erythræ'a Centau'rium, Persoon, L. E. D.—*Common Centaury.*

Sex. Syst. Pentandria, Monogynia.

(Centaurium, *L.*—The flowering heads, *E.*—Folia, *D.*)

History.—This plant was known to the ancients, and received one of its names (*Chironia Centaurium*) from Chiron the Centaur, who is said to have lived 1270 years before Christ. But the plant which Pliny (*Hist. Nat.* lib. xxv. cap. 30, ed. Valp.) says cured Chiron of a wound received by an arrow, which he dropped on his foot when examining the arms of Hercules, is supposed to be the *Centaurea Centaurium.*

Botany. *Gen. Char.*—*Calyx* five-parted, equal. *Corolla* hypocrateriform with a cylindrical tube, withering over the capsule. *Stamens* five; anthers becoming spiral. *Stigmas* bilamellate. *Capsule* one-celled, or half two-celled (Lindley).

Sp. Char.—*Stem* nearly simple. *Panicle* forked, corymbose. *Leaves* ovate-lanceolate. *Calyx* half the length of the tube; its segments partly combined by a membrane (Smith).

Root small, tapering. *Stem* about a foot high, leafy. Radicle *leaves* obovate; the rest acute, ovate, or elliptic-lanceolate; all three-ribbed, bright green. *Flowers* nearly sessile. *Bracts* opposite, awl-shaped. *Calyx* slender. Tube of *corolla* pale-greenish; limb brilliant pink, expanded only in sunshine, closing as soon as gathered.

Hab.—Indigenous: dry gravelly pastures. Annual. Flowers in July and August.

Description.—The herb or tops (*herba* seu *summitates* vel *cacumina centaurii minoris*) of the common or lesser centaury are without odour, but have a very bitter taste. They are collected when in flower.

Composition.—According to Moretti (*Journ. de Pharm.* t. v. p. 98), common centaury contains *bitter extractive*, *free acid*, *mucous matter*, *extractive*, *salts* [and *woody fibre*].

Bitter matter (*Centaurin*).—The principal constituent of common centaury is the bitter extractive, called by Dulong d'Astafort (*Journ. de Pharm.* t. xvi. p. 502) *centaurin.* This, when combined with hydrochloric acid, is said to be an excellent febrifuge. Centaurin must not be confounded with *centaurite*, the bitter principle of *Cnicus benedictus*, Dec.

Physiological Effects.—Similar to those of gentian (p. 895), and of other simple or pure bitters (see p. 79).

Uses.—Common or lesser centaury is rarely used by medical practitioners; yet it might be employed as an indigenous substitute for gentian. Dose of the powder, ℈j. to ʒj. It may be also used in infusion.

Menyan'thes trifolia'ta, Linn. L. E. D.—*Common Buckbean; Marsh Trefoil.*

Sex. Syst. Pentandria, Monogynia.

(Menyanthes, *L.*—Leaves, *E.*—Folia, *D.*)

History.—Sprengel (*Hist. Rei Herb.* t. i. p. 82) considers this to be the plant referred to by Theophrastus (*Hist. Plant.* lib. iv. cap. 11) under the name of *μήνανθος*.

Botany. *Gen. Char.*—*Calyx* five-parted. *Corolla* funnel-shaped; the limb spreading, five-lobed, equal, hairy on the inside. *Stamina* five. *Style* one; *stigma* capitate, two- to five-grooved. *Capsule* one-celled; the parietes seminiferous (*Bot. Gall.*)

Sp. Char.—*Leaves* ternate. Disk of the *corolla* densely shaggy (Smith).

Rhizoma black, creeping, jointed. *Leaves* on long stalks, with broad sheathing stipules at base: they are trifoliate; leaflets nearly oval, smooth. *Scape* round, ascending, smooth. *Bracts* ovate. *Calyx* obtuse. *Corolla* white or flesh-coloured, elegant. *Anthers* yellow.

Hab.—Indigenous; watery meadows, ditches, &c.; frequently cultivated in ornamental aquaria, on account of the beauty of the flowers. Perennial. Flowers in June and July.

Description.—The whole herb (*herba menyanthis* seu *trifolii fibrinii*) is odourless, but has a very bitter taste. Its infusion strikes a green colour (*tannate of iron*) with the sesquichloride of iron. The leaves (*folia menyanthis*) are the parts usually employed.

Composition.—Menyanthes was analyzed by Trommsdorf (*Ann. di Chim.* t. lxxii. p. 191), who found that the fresh plant consists of 75 parts of moisture and 25 of solid matter, composed of *bitter extractive*, *vegetable albumen*, *green resin* (*chlorophylle*), *peculiar matter* precipitable by tannic acid, but soluble in water and in weak spirit, *brown gum*, *fecula* (*inulin* or *menyanthin*), *malic acid*, and *acetate of potash.*

The *bitter extractive* is the active principle. Brandes states that he procured a white bitter powder from menyanthes; but B. Trommsdorf (*Pharm. Cent.-Blatt. für* 1832, p. 458) repeated Brandes's experiments, and procured only a yellowish-brown bitter extract.

Physiological Effects.—Tonic and astringent. In large doses cathartic, and sometimes emetic.

Uses.—This plant is used by the brewers of some parts of Germany, particularly Silesia and the adjacent provinces, as a substitute for hops (Yosy, *Orig. and Progress of the Med. Bot. Soc.* p. 12). It is rarely employed in medicine, but is applicable for the same purposes as the other bitter tonics (see p. 79). It has been esteemed efficacious as an antiscorbutic (Murray, *App. Med.* t. ii. p. 34).

Administration.—It may be given in *powder*, *infusion*, or *extract*. The dose of the powder is from ℈j. to ʒss.: if given to the extent of ʒj. it generally purges. The dose of the *infusion* (prepared with ℥ss. of the dried herb, and f℥xvj. of boiling water) is f℥j. to f℥ij.; of the watery *extract*, grs. x. to grs. xv.

Other Medicinal Gentianaceæ.

Frase'ra Wal'teri, or the *American Calumba*, is a native of the southern and western portions of the United States, and is very abundant in Arkansas and Missouri. The root is officinal in the pharmacopœia of the United States. As met with in commerce, it is in transverse circular segments, about an inch in diameter, and an eighth of an inch, or more, in thickness. It contains no starch, and hence undergoes no change of colour when touched with iodine. Its infusion or decoction becomes blackish-green (*tannate of iron*) when treated with sulphate of iron, and lets fall a precipitate (*tannate of gelatin*) on the addition of a solution of isinglass. The effects, uses, and doses of Frasera are the same as those of gentian. The fresh root is said to operate as an emetic and cathartic (*United States Dispensatory*). Some years ago it was introduced into France, and sold for calumba; hence it got the name of *false calumba*. The chemical characters above given, as well as the physical properties of the root, readily distinguish it (Guibourt, *Journ. de Chim. Méd.* t. ii. p. 334).

ORDER 39. SPIGELIA'CEÆ, *Martius*.—THE WORMGRASS TRIBE.

ESSENTIAL CHARACTER.—*Calyx* inferior, regular five-parted. *Corolla* regular, with five lobes, which have a valvate æstivation. *Stamens* five, inserted into the corolla, all in the same line; *pollen* three-cornered, with globular angles. *Ovary* superior, two-celled; *style* articulated with it, inserted; *stigma* simple. *Fruit* capsular, two-celled, two-valved, the valves turned inwards at the margin, and separating from the central placenta. *Seeds* several, small; *testa* single; *embryo* very minute, lying in a copious fleshy *albumen*, with the radicle next the *hilum*.—*Herbaceous* plants, or *under-shrubs*. *Leaves* opposite, entire, with stipules, or a tendency to produce them. *Flowers* arranged in one-sided spikes. *Pubescence* simple or stellate (Lindley).

PROPERTIES.—See *Spigelia*.

Spige'lia Marilan'dica, Linn. L. E. D.—*Carolina Pink; Perennial Worm Grass.*

Sex. Syst. Pentandria, Monogynia.

(Radix, *L. D.*—Root, *E.*)

HISTORY.—The anthelmintic virtues of this plant were first learned from the Cherokee Indians, who became acquainted with them, according to Dr. Garden, about 1723; they were made known to the profession about 1740 (*Essays and Obs. Phys. and Lit.* vol. iii.)

BOTANY. *GEN. CHAR.*—*Calyx* five-parted. *Corolla* funnel-shaped, with a five-cleft equal limb. *Anthers* converging. *Capsule* didynamous, two-celled, four-valved, many seeded (Lindley).

SP. CHAR.—*Stem* simple, herbaceous. *Leaves* opposite, sessile, ovate, acuminate.

Root perennial. *Stems* composed of numerous fibres from a short, cylindrical rhizome. *Stems* several, erect, four-sided and winged (from the decurrent leaves). *Leaves* decussate, ovate-lanceolate, acuminate, entire, smooth, but somewhat slightly pubescent on the veins and margins. *Flowers* in simple one-sided spikes (or racemes). *Corolla* much longer than the calyx, of a rich carmine colour externally, paler at the base, and orange-yellow within *Capsule* obcordate, smooth. *Seeds* several in each cell.

HAB.—Southern States of North America; seldom found north of the Potomac.

COLLECTION.—"It is collected by the Creek and Cherokee Indians, who dispose of it to the white traders. By these it is packed in casks, or more commonly in large bales, weighing from three hundred to three hundred and fifty pounds. That contained in casks is to be preferred, as less liable to be damp and mouldy. Owing to the imperfect manner in which the plant is dried, it seldom happens that packages of it reach the market free from dirt and mouldiness, and having the stalks of a bright colour. Some parcels have been recently brought free from the stalks, and have commanded more than double the price of the drug prepared in the usual way" (*United States Dispensatory*).

DESCRIPTION.—The dried plant (*herba spigeliæ*), as usually met with in the shops, is of a greyish green colour, a faint odour, and a bitter taste. The root (*radix spigeliæ*) consists of numerous, slender, branching, dark brown fibres, issuing from a short, dark brown rhizome.

COMPOSITION.—The herb and root have been analyzed by Wackenroder (Gmelin's *Handb. d. Chem.* ii. 1298). Feneulle (*Journ. de Pharm.* t. ix. p. 197) probably analyzed this plant under the name of *Spigelia anthelmintica.*

Wackenroder's Analyses.

Myricin	0·30	Fixed oil	a trace.
Resin, with chlorophylle	2·40	Acrid resin, with some fixed oil	3·13
Peculiar resin	0·50	Peculiar tannin	10·56
Peculiar tannin	17·20	Bitter acrid extractive	4·89
Woody fibre	75·20	Woody fibre (which yields 16·74 of ashes)	82·69
Malate of potash, and chloride of potassium	2·10		
Malate of lime	4·20		
Herb of spigelia	101·90	Root of spigelia	101·27

1. *Bitter extractive.*—Feneulle ascribes the activity of Spigelia to a brown, bitter extractive, like that of the purgative Leguminosæ. Taken internally, it causes vertigo and a kind of intoxication. It is, I presume, identical with the *bitter acrid extractive* of Wackenroder.

2. *Resin.*—This is described, by Wackenroder, as having an acrid, nauseous taste. It is soluble in ammonia and in oil of vitriol. It evolves ammonia when heated.

PHYSIOLOGICAL EFFECTS.—The physiological effects of this root have not been accurately determined; but the observations hitherto made shew them to be those of a local irritant (or acrid) and narcotic substance.

In the *ordinary dose* (one or two drachms for adults) it has very little sensible effect on the system, though it may act efficaciously as an anthelmintic. In *larger doses* it appears to operate as an irritant to the gastro-intestinal canal, and gives rise to purging and sometimes to vomiting, though its effects in this way are very uncertain. In *poisonous* doses it operates as a cerebro-spinant or narcotic, giving rise to "vertigo, dimness of vision, dilated pupils, spasms of the facial muscles, and sometimes even to general convulsions. Spasmodic movements of the eyelids have been observed among the most common attendants of its narcotic action. The death of two children, who expired in convulsions, was attributed by Dr. Chambers to the influence of spigelia. The narcotic effects are said to be less apt to occur when the medicine purges, and to be altogether obviated by combining it with cathartics. The danger from its employment cannot be great, as it is in very general use in the United States, both in regular and domestic practice, and we never hear at present of serious consequences. Its effects upon the system have been erroneously conjectured to depend on other roots sometimes mixed with the genuine" (*United States Dispensatory*).

Uses.—Employed only as an anthelmintic. Its vermifuge properties were first made known to the profession by Drs. Lining (*Essay and Obs. Phys. and Lit.* vol. i. p. 386) and Garden (*Ibid.* vol. iii. p. 145). Though scarcely used in this country, it stands at the head of anthelmintics in the United States of America.

Administration.—The dose of the *powder* for a child of three or four years old, is from grs. x. to grs. xx.: for an adult, ʒj. to ʒiij. This quantity is repeated, every morning and evening, for several days, and then followed by a brisk cathartic. It is frequently combined with calomel.

Infusum Spigeliæ, Ph. Un. States. (Spigelia root, ℥ss.; Boiling water, f℥xvj. Macerate for two hours in a covered vessel, and strain).—The dose for a child of two or three years old is fʒss. to fʒj.: for an adult, from fʒiv. to ℥viij., repeated morning and evening. A quantity of senna, equal to that of the spigelia, is usually added, to insure a cathartic effect.

A preparation kept in the shops of the United States, and much prescribed by physicians, under the name of *worm tea*, consists of spigelia root, senna, manna, and savine, mixed together in various proportions to suit the views of different individuals (*United States Dispensatory*).

Other Medicinal Spigeliaceæ.

Spige'lia anthelmin'tica is a native of South America and the West India Islands. Its action is similar to that of the last mentioned species So poisonous has it been regarded, that in France it is called *Brinvillière*, after the Marchioness de Brinvilliers, a woman famous for poisoning in the reign of Louis XIV., and who was executed on the 16th of July, 1676 (Guibourt, *Hist. des Drog.* t. ii. p. 227). Its anthelmintic properties were noticed in 1751, by Dr. Browne (*Gentleman's Magazine* for 1751). This plant was analyzed by Ricord Madianna (Gmelin, *Handb. d. Chem.* ii. 1297). Dr. Brown (*Nat. Hist. of Jamaica*, p. 157) says, it procures sleep almost as certainly as opium.

Order 40. Asclepiada'ceæ, *Lindley*.—The Swallow-wort Tribe.

Asclepiadeæ, *R. Brown.*

The plants of this order are for the most part acrids. In large doses they are emetic and cathartic: in small doses, expectorant, diaphoretic, and alterative. The roots are the parts usually employed in medicine.

Though none of the species are contained in the British pharmacopœias, yet several have attracted the attention of practitioners in this country.

Calot'ropis gigante'a, R. Brown (*Asclep'ias gigante'a*, Linn.) has been introduced from India under the name of *Mudar* or *Madar*. It is said to contain a peculiar principle called *mudarine*, which coagulates by heat, and becomes again fluid on exposure to cold (Wight, *Contrib. to the Bot. of India*). The principal value of Madar is as an alterative and sudorific. It has been employed in venereal diseases, chronic cutaneous affections, and various other maladies (Playfair, *Trans. of the Med. and Phys. Soc. Calcutta*, vol. i. p. 84). Mr. Robinson (*Med. Chir. Trans.* vol. x. p. 27) found it decidedly useful in a species of elephantiasis which Mr. Playfair calls jugara or leprosy of the joints. The powder of the bark of the root is given in doses of from grs. iij to grs. x. Dr. Ainslie (*Mat. Ind.* vol. i. p. 486, and vol. ii. p. 488) considers the dried milky juice more efficacious.

The root of *Hemides'mus in'dicus*, R. Brown (*Periploca indica*, Willd. *Asclepias pseudosarsa*, Roxb.) is used in India under the name of *country sarsaparilla*. The attention of practitioners in this country was drawn to it by Dr. Ashburner in 1831 (*Lond. Med. and Phys Journ.* vol. lxv. p. 189); and again in 1833 (*Lond. Med. Gaz.* vol. xii. p. 350). It has been called *Indian* or *scented sarsaparilla*, *nannari*, or the root of *Smilax aspera*. How this last and erroneous appellation became applied to it, I cannot tell; for I find from specimens of the root of Smilax aspera brought from the South of Europe, that no resemblance exists between the latter and the root of Hemidesmus indicus. The latter is brownish externally, and has a peculiar aromatic odour, and a feeble, bitter taste. It is long, tortuous, cylindrical, rugous, furrowed longitudinally, and has its cortex divided, by transverse fissures, into moniliform rings. The cortical portion has a corky consistence, and surrounds a ligneous meditullium. Mr. Garden (*Lond. Med. Gaz.* vol. xx. p. 800), obtained from it a volatile, crystallizable acid, on which the taste, smell, and, probably, the medicinal properties depend. From an erroneous notion of the origin of the root, he called the acid the *smilasperic acid*, but it may with more propriety be termed *hemidesmic acid*. Hemidesmus indicus has been employed as a cheap and efficacious substitute for sarsaparilla in cachectic diseases; but both its effects and uses require a more extended examination than has yet been devoted to them. Dr. Ashburner says it increases the appetite, acts as a diuretic, and improves the general health; "plumpness, clearness, and strength succeeding to emaciation, muddiness, and debility." It has been used with benefit in venereal diseases. In some cases it has appeared to succeed where the sarsaparilla had failed; and *vice versâ* it has frequently failed where sarsaparilla succeeds. The Tamool doctors employ it in strangury and gravel (Ainslie, *Mat. Ind.* vol. i. p. 382). It may be administered in the form of *infusion* (prepared by steeping ℥ij. of the root in Oj. of boiling [or lime] water for twelve hours); a pint of which may be given in twenty-four hours, in doses of a wine-glassful. The *decoction* may be substituted for the infusion. Carbonate of soda is frequently added to it. The *extract* is objectionable, as the heat used in preparing it must volatilize, part at least of, the hemidesmic acid. A *syrup* has also been employed. The *powder of the bark of the root* is used in India against the thrush (Roxburgh, *Fl. Med.* vol. ii. p. 40).

The leaves of *Cynan'chum Ar'gel* are employed by the Egyptians to adulterate the senna of that country. I believe all the *Alexandrian senna* brought to England contains some portion of these leaves. (For their characters and effects see the Order LEGUMINOSÆ).

The substance called *French* or *Montpellier Scammony* (*scammonium gallicum*) is made, in the southern part of France, with the expressed juice of *Cynan'chum monspeli'acum*, mixed with different resins and other purgative substances. It occurs in semicircular, blackish, hard, compact cakes, which frequently have the smell of balsam of Peru. The juice of this plant has been analyzed by Marquart (*Pharm. Centr.-Blatt für* 1837, s. 693).

A substance called *Smyrna Scammony* (*scammonium smyrneum*) is said to be obtained from the *Secamo'ne Alpi'ni*, Römer and Schultes (*Periplo'ca Secamo'ne*, Linn.); and Marquart (*Pharm. Central-Blatt für* 1837, p. 696), has analyzed some substances bearing this name (*see* p. 883 and 886).

ORDER 41. APOCYNA'CEÆ, *Lindley*.—THE NUX-VOMICA TRIBE.

ESSENTIAL CHARACTER.—*Calyx* divided into five, persistent. *Corolla* monopetalous, hypogynous, regular, five-lobed, with contorted æstivation, deciduous. *Stamens* five, arising from the corolla, with whose segments they are alternate. *Filaments* distinct. *Anthers* two-celled, opening lengthwise. *Pollen* granular, globose, or three-lobed, immediately applied to the stigma. *Ovaries* two, or one- to two-celled, polyspermous. *Styles* two or one. *Stigma* one. *Fruit* a follicle, capsule, or drupe or berry, double or single. *Seeds* with fleshy or cartilaginous *albumen; testa* simple; *embryo* foliaceous; *plumule* inconspicuous; *radicle* turned towards the hilum.—*Trees* or *Shrubs*, usually milky. *Leaves* opposite, sometimes whorled, seldom scattered, quite entire, often having ciliæ or glands upon the petioles, but with no stipules. *Inflorescence* tending to corymbose. (Lindley).

PROPERTIES.—Extremely variable. An order which contains the Nux-vomica, Upas Tieuté, the Wooraly, and the Tanghin poisons, cannot but be regarded with suspicion and dread. Yet it contains harmless and edible species (see Royle's *Illustrations*, p. 272).

Strych'nos Nux-vom'ica, Linn., L. E. D.—*The Poison-nut.*

Sex. Syst. Pentandria, Monogynia.

(Semina, *L.*—Seeds, *E.*)

History.—We became acquainted with Nux-vomica through the Arabian authors. In the Latin translation of one of the works of Serapion (*De Simplic. Med.* clxiii. p. 115, Argent. 1531) we find the word nux-vomica, but it appears to have been applied to some other substance (probably to St. Ignatius's bean). "Est nux," says he, "cujus color est inter glaucedinem et albedinem, major avellana parum et sunt in ea nodi." To which he afterwards adds, "movet vomitum;" from which I presume the name of *vomic*, or *vomiting nut*, was originally derived. Mesue also mentions nux-vomica. Avicenna (lib. 2ndus. tract 2ndus. cap. 509) says, nux-methel "est similis nuci vomicæ." It is probable that the *nux-mechil* of Serapion is the substance which we denominate nux-vomica.

Botany. *Gen. Char.*—*Calyx* four- to five-parted. *Corolla* tubular, with a spreading four- to five-cleft limb, and a valvate æstivation. *Stamens* four to five, inserted into the throat of the corolla, which is either naked or bearded. *Ovary* two-celled, with indefinite ovules attached to a central placenta; *style* one; *stigma* capitate. *Berry* corticated, one-celled, many-seeded, or by abortion one-seeded. *Seeds* nidulant, discoidal. *Albumen* large, cartilaginous, almost divided into two plates. *Embryo* with leafy cotyledons (Lindley).

Fig. 182.

Strychnos Nux-vomica.

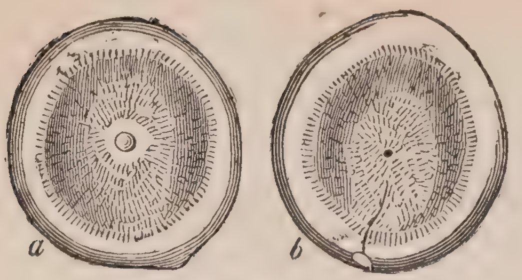
Sp. Char.—*Leaves* opposite, three- and five-nerved, oval, lucid. *Berries* many-seeded (Roxburgh).

Middling-sized *tree*. *Trunk* short, often crooked, pretty thick; the *branches* irregular; the *wood* white, hard, and bitter. *Leaves* opposite, oval, shining, entire, three- to five-nerved. *Corymbs* small, terminal. *Calyx* five-toothed. *Corolla* funnel-shaped, greenish-white. *Stamina* five, inserted over the divisions of the corolla. *Ovarium* two-celled. *Style* the length of the corolla. *Stigma* capitate. *Berry* round, smooth, size of a pretty large apple, covered with a smooth, somewhat hard, *shell*, of a rich orange-colour when ripe, filled with a white, soft, gelatinous *pulp*, which is greedily eaten by many sorts of birds. *Seeds* several, immersed in the pulp of the berry, and attached to a central placenta.

Hab.—Coromandel, and other parts of India; Ceylon.

Description.—The *seeds* (*nuces vomicæ*) of commerce are round, peltate, scarcely an inch in diameter, nearly flat, or very slightly convex on one side, and concave on the other, and are surrounded by a filiform, annular stria. From their fancied resemblance to grey eyes, as well as from their being poisonous to crows, the Germans term them *Krähenaugen*, or *crows' eyes*. In the centre of the ventral surface of the seed is the orbicular hilum or umbilicus.

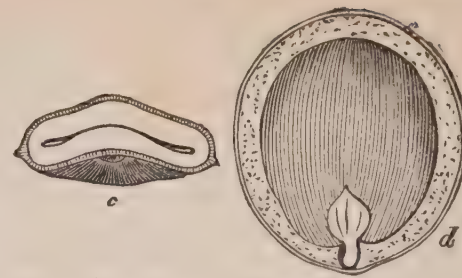
Fig. 182.



Nux-vomica.

a. The convex surface.
b. The concave surface.

Fig. 183.

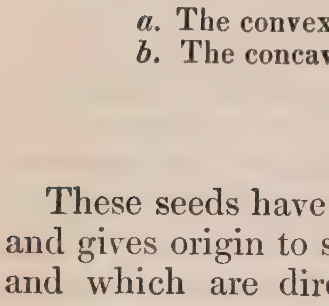


Sections of Nux-vomica.

c. Transverse section of seed.
d. Vertical section, exposing the internal cavity, and showing the situation and figure of the embryo.

These seeds have two coats; the outer one, or *testa*, is simple, fibrous, and gives origin to short silky hairs, of an ash-grey or yellowish colour, and which are directed from the centre towards the circumference: within this is the inner coat, or *endopleura*, which is simple, and very thin, and envelops the nucleus of the seed.

Fig. 184.



Magnified view of a portion of the seed-coats of nux-vomica.

a. Testa, with hairs attached.
b. Endopleura.
c. Albumen.

This nucleus is composed of two parts—namely, albumen and embryo. The *albumen* is bipartite, cartilaginous, or horny; of a dirty-white colour, of an intensely bitter taste, and has, in its interior, a cavity (*loculamentum verum*). Unlike that of most seeds, the albumen of nux vomica is of a poisonous nature. The *embryo*, which is milk-white, is seated in the circumference of the seed, its locality being frequently indicated by a point somewhat more projecting than the surrounding parts. It consists of two large cordiform, acuminated, triple-ribbed, very thin cotyledons, a distinct cauliculus, and a centripetal radicle (*i. e.* a radicle directed towards the centre of the fruit).

The *bark* of the Strychnos nux-vomica (*nux-vomica bark*; *cortex strychnos nucis vomicæ*; *cortex angusturæ spuriæ* seu *falsæ*; *cortex pseudo-angusturæ* seu *virosæ*) occurs in quills or flat pieces (*augustura falsa convoluta* seu *plana*), or in pieces arched backwards, having the twisted appearance of dried horn. It is more compact and heavy than real angustura bark. The epidermis varies; sometimes it consists of a dark fungoid, or spongy rust-coloured layer (hence the term *angustura ferruginea*), which is only the altered epidermis; at other times it is not thick, not fungous, but covered with numerous whitish prominences, formerly supposed to be some species of lichen (*Chiodecton*), but now known to be only an epidermoid alteration, a kind of leprous exuberance, the more advanced stage of which constitutes the rust-coloured layer already mentioned (Fée, *Essai sur les Cryptog. des Ecorces exot.* p. 16, 1824). The powder is intensely bitter, and of a yellowish-white colour.

Nux-vomica bark was formerly confounded with angustura or cusparia bark: hence its name of *false angustura bark*. The history of the mistake is as follows:—In 1804, Dr. Rambach, a physician at Hamburgh, observed that some specimens of angustura bark, said to be from the East Indies, acted as a powerful poison; and as repeated cases of poisoning occurred with the same substance, an order was issued, forbidding the use of angustura bark. On the 15th of October, 1815, the Commission of Health of the Grand Duchy of Baden ordered all the angustura bark in the possession of the apothecaries to be seized, and placed under a seal; the physicians at the same time receiving an intimation that they were not, in future, to prescribe this bark. Similar ordinances were issued in Austria, Bavaria, and Wirtemberg (Schwartze, *Pharm. Tabell.* S. 95, 2te, Ausg. 1833; *Hufeland's Journ.* Bd. xix. St. i. S. 181).

The origin of the bark is said, by Batka, to be as follows:—A quantity of it was imported from the East into England, and not being saleable, was sent to Holland; and as no better means of getting rid of it offered, it was mixed with, and sold as, genuine angustura or cusparia bark (Guibourt, *Hist. des Drog.* t. ii. p. 4, 3me éd. 1836). Great obscurity long existed as to the tree which yielded it. At first it was attributed to the *Brucea ferruginea* or *antidysenterica*, a native of Abyssinia, belonging to the family Xanthoxylaceæ; but in 1831, Geiger had occasion to examine the bark of the B. ferruginea, and found that it had no resemblance to false angustura (*Pharm. Centr.-Blatt für* 1831, S. 477). Now, the composition and effects of this bark rendered it, in the highest degree, probable, that it was the product of some tree of the family Apocynaceæ, most probably of the genus Strychnos; Batka said, of the *S. nux-vomica*, or some kindred species; an opinion which was confirmed by my examination of the specimens of the nux-vomica plant in Dr. Wallich's collection, in the possession of the Linnean Society (*Lond. Med. Gaz.* vol. xix. p. 492). In 1837, Dr. O'Shaughnessy (*Madras Journal* for April, 1837) established the identity of false angustura bark and the bark of the nux-vomica tree. Since then I have examined about 1 cwt. of the latter bark brought to this country, and find it to be identical with false angustura bark contained in my museum, and which I had purchased in Paris several years before.

Commerce.—In 1838, there were imported 1017 lbs. of nux-vomica; in 1839, only 478 lbs. The duty is 2s. 6d. per lb.

Composition.—The *seeds* of Strychnos Nux-vomica have been analyzed by Rese (Pfaff, *Syst. d. Mat. Med.* Bd. ii. S. 90), Desportes (*Bull. de Pharm.* t. i. p. 271), Braconnot (*Ibid.* t. iii. p. 315), Chevreul (Orfila, *Toxicol. Gén.*), and Pelletier and Caventou (*Ann. Chim. et Phys.* t. x. p. 142). The most important of these analyses is that made by the last-mentioned chemists; who also examined the *bark* of Strychnos Nux-vomica, under the name of *false angustura* (*Ibid.* t. xii. p. 113). The leprous coating of this bark they afterwards (*Journ. de Pharm* t. v. p. 546) submitted to a separate examination, under the idea of its being a lichen.

Pelletier and Caventou's Analyses of the Strychnos Nux-vomica.

1. *Of the Seeds.*	2. *Of the Bark.*
Strychnic, or igasuric acid. Strychnia } in combination with strychnic Brucia } acid. Wax (a small quantity). Concrete oil. Yellow colouring matter. Gum. Starch (a little). Bassorin. Woody fibre. Carbonate of lime and chloride of potassium in the ashes.	Gallate of brucia. Fatty matter (not deleterious). Gum (a considerable quantity). Yellow colouring matter and alcohol. Sugar (traces). Woody fibre.
Nux-vomica seeds.	Nux-vomica (false Angustura) bark.
	The leprous coating was composed of a *greenish yellow oil*, *yellow colouring matter*, *reddish yellow colouring matter*, [and *woody fibre*].

1. *Strychnia (Strychnina; Vauquelina; Tetanine).* Discovered in 1818, by Pelletier and Caventou. Found in *Strychnos Nux-vomica*, *S. Ignatia*, *S. Colubrina*, and *S. Tieuté*. In these plants it is frequently associated with brucia, and is always com-

bined with an acid. Pure strychnia is a white, odourless, intensely bitter, crystalline substance, the form of the crystals being the octahedron or four-sided prism. When rapidly crystallized, it assumes the granular form. It is fusible, but not volatile; decomposing at a lower temperature than most vegetable bodies. Though so intensely bitter, it is almost insoluble in water, one part of strychnia requiring 6667 parts of water, at 50°, to dissolve it; that is, one grain needs nearly fourteen ounces of water to hold it in solution. It requires 2500 parts of boiling water to dissolve it. It is slightly soluble in boiling rectified spirit, but scarcely so in cold water. It acts on vegetable colours as an alkali, saturates acids forming salts, and separates most of the metallic oxides (the alkaline substances excepted) from their combinations with acids. In some cases, part only of the metallic oxide is precipitated, a double salt being formed in solution. Thus, when strychnia is boiled with a solution of sulphate of copper, a green solution of *cupreous sulphate of strychnia* is obtained, while a portion only of the oxide of copper is precipitated.

Commercial strychnia usually forms, with strong nitric acid, a red coloured liquid, which afterwards becomes yellow. This change does not occur with pure strychnia, but depends on the presence of one or both of two substances—viz. brucia and yellow colouring matter. As the red colour is destroyed by decolorizing agents (sulphurous acid and sulphuretted hydrogen), it appears to depend on the oxidizement of the substances referred to. If potash be added to a very concentrated solution of a strychnian salt which has been reddened by nitric acid, an orange precipitate is formed: an excess of water dissolves this precipitate.

A solution of bichloride of mercury, added to a solution of strychnia in hydrochloric acid, causes a white clotty precipitate (composed of *bichloride of mercury and hydrochlorate of strychnia*).

Anhydrous strychnia is composed, according to Liebig, of C^{30}, H^{10}, NO^3; its atomic weight, therefore, is 234. The *salts of strychnia*, when pure, are for the most part crystalline, white, and very bitter. They possess the following chemical characters:—1st. They are precipitated by the alkalies and their carbonates. 2dly. As usually met with in the shops, they are reddened by nitric acid. 3dly. They are precipitated by tannic, but not by gallic acid. 4thly. They are unchanged by the action of the persalts of iron.

α. *Sulphates.*—The *neutral sulphate* exists in the form of small cubes, soluble in ten parts of water at 59° F., and in a less quantity of boiling water. When heated, it fuses and loses three per cent. of its weight, probably water of crystallization. But Liebig detected no water in sulphate dried at 212° F. The *bisulphate* has an acid and bitter taste, and crystallizes in slender needles.

β. *Nitrates.*—The *neutral nitrate* crystallizes in pearly needles, grouped in stars. It is much more soluble in hot than cold water; is slightly soluble in alcohol, but does not dissolve in ether. When heated to a little above 212°, it decomposes and becomes yellow, swells up, detonates slightly (but without the disengagement of light), and leaves a carbonaceous mass behind. If the strychnia contain brucia, the nitrate has a reddish tint. The *binitrate* crystallizes in very fine needles. When heated, decomposes, becomes red, and detonates with the disengagement of light.

γ. *Hydrochlorate* or *Muriate.*—This salt crystallizes in four-sided needles, which lose their transparency in the air. It is much more soluble in water than the sulphate. When heated, it is decomposed with the evolution of hydrochloric acid.

2. *Brucia* (*Brucina; Vomicina*, Guib.), discovered in 1819, by Pelletier and Caventou, exists in the bark and seeds of nux-vomica, and in St. Ignatius's bean: in the two latter substances it is associated with strychnia, and is in combination with igasuric acid; while in nux-vomica it is combined with gallic acid. Brucia in the anhydrous form, as obtained by fusing it, has a waxy appearance; but when combined with water, it is capable of crystallizing, the form of the crystals being oblique four-sided prisms; or sometimes the crystals have a pearly laminated appearance, something like boracic acid. Its taste is very bitter, though less so than that of strychnia. When the crystallized brucia is heated, it gives out 17 per cent. of water, and fuses. It is soluble in 850 parts of cold, or 500 parts of boiling water; but the presence of colouring matter, of which it is difficult to deprive it, promotes its solubility. It is very soluble in alcohol, but is insoluble in ether and the fixed oils, and is very slightly soluble only in the volatile oils. Nitric acid assumes a fine red colour when added to brucia: deoxidizing agents, as sulphuretted hydrogen and sulphurous acid, decolourize this solution (see above). Iodic and chloric acids produce the same phenomena as nitric acid. Anhydrous brucia consists, according to Liebig, of C^{32} H^{18} NO^6: its atomic weight, therefore, is 272. In the crystallized state it contains six equivalents of water. The *salts of brucia* are readily formed by

saturating dilute acids with brucia. They possess the following properties:—For the most part they are soluble and crystallizable, and have a bitter taste. They are decomposed by potash, soda, ammonia, the alkaline earths, morphia, and strychnia, which precipitate the brucia. They produce precipitates (*tannate of brucia*) on the addition of tannic acid. Nitric acid colours them as it does free brucia.

3. *Strychnic* or *Igasuric acid.*—Exists in the seeds of nux-vomica, St. Ignatius's bean, and snake wood. Dr. A. T. Thomson (*Lancet*, Sept. 16, 1837) thinks that igasurate of strychnia exists in *Arnica montana.* Igasuric acid is crystallizable, and has an acid, rough taste. It is soluble in water and alcohol. The salts of iron, mercury, and of silver in solution, are unaffected by it; but those of copper are rendered green; and after some time a light green precipitate is deposited.

4. *Yellow colouring matter.*—Found in the seeds and bark of nux-vomica, in St. Ignatius's bean, and the Upas Tieuté. Also in *Strychnos pseudo-quina*, casca d'anta, and pereira bark (see p. 922). It is soluble in water and alcohol, and is reddened by nitric acid.

5. *Reddish yellow colouring matter.*—Resides in the rust-coloured epidermoid alteration of nux-vomica bark. Also in *Strychnos pseudo-quina* (see p. 922). It is insoluble in cold water and in ether, but dissolves with facility in alcohol. Nitric acid renders it deep green by combining with it.

6. *Other constituents.*—The *wax* mentioned in the above analysis is probably derived from the hairs with which the seeds are invested; it enables them to resist moisture. *Resin* is probably a constituent of the seeds; for tincture of nux-vomica is rendered milky by water. *An odorous, non-acid, innocuous* principle is obtained by submitting nux-vomica and water to distillation. Meissner detected *copper* in the ashes of nux-vomica; but I have several times repeated his experiment without recognizing this metal.

Chemical Characteristics. 1. *Of the Seeds.*—*Powdered nux-vomica* has a fallow grey colour, a bitter taste, and a peculiar odour analogous to that of liquorice. Thrown on burning coals it inflames when the temperature is very high; but when lower, is decomposed, evolves a thick white smoke of a peculiar odour, and leaves a carbonaceous residuum. Concentrated sulphuric acid blackens it. Nitric acid communicates to it a *deep orange-yellow colour.* If the powder be digested with boiling water acidulated with sulphuric acid, the filtered liquor is turbid and slightly yellow. Nitric acid, after some minutes, reddens it; ammonia makes it brown, and precipitates blackish flocks. If the sulphatic solution be digested with finely powdered marble (to saturate the excess of acid), then evaporated to dryness, and the residue treated with boiling alcohol, we obtain a spirituous solution of sulphates of strychnia and brucia, with colouring matter. This has a bitter taste, is reddened by nitric acid, produces convulsions when given to birds or other small animals, and forms a flocculent coloured precipitate on the addition of ammonia. Sometimes crystals are deposited from the alcoholic liquor, on standing for two or three days (Orfila and Barruel, *Arch. Gén. de Méd.* viii. 22; R. D. Thomson, *Brit. Ann. of Med.* i. 106).

Ammoniacal-sulphate of copper added to the *infusion* or *decoction of nux-vomica*, produces an emerald-green colour, and gradually a greenish white precipitate (*igasurate of copper*): ammoniacal sulphate of strychnia remains in solution. Sesquichloride of iron also produces an emerald colour, which disappears on the addition of hydrochloric acid: this coloration does not depend, according to Pelletier and Caventou, on the igasuric acid; nor can it depend on tannic acid, for gelatin gives no indication of this substance: if the decoction be boiled with animal charcoal, it loses the power of becoming green on the addition of a ferruginous salt. Nitric acid communicates an orange-red colour to the decoction, owing to its action on the brucia and yellow colouring matter. A solution of iodine communicates a yellowish-brown tint to the decoction; but after a few minutes the colour disappears (owing, perhaps, to the formation of the hydriodates of strychnia and brucia), and the iodine is no longer detectable by starch, without the addition of nitric acid or chlorine. Tannic acid, or infusion of nutgalls, produces in the decoction a copious precipitate (*tannates of strychnia, brucia*, and *some other vegetable matter*). Alcohol also causes a precipitate (*gum*). Acetate and diacetate of lead cause abundant precipitates (composed of *gummate and igasurate of lead, with colouring and fatty matter*).

2. *Of the Bark.*—An infusion of this bark reddens litmus, in consequence of the excess of acid present. Strong nitric acid added to this solution produces a red colour; and by dropping the acid on the inner surface of the bark, a blood-red spot is produced: in both these cases the effect arises from the action of the acid on the brucia and yellow colouring matter. If nitric acid be applied to the external surface of the bark, it produces a deep green colour, in consequence of the action of the acid on the yellow colouring matter (see *Strychnos pseudo-quina*, p. 922). Infusion of galls added to the infusion of this bark occasions a white precipitate (*tannate of brucia*). Sulphate of iron colours the infusion green, from its action on the yellow colouring matter.

Physiological Effects. 1. *Of the Bark.* (*a.*) *On animals generally.*—The experiments of Pfaff, the Vienna faculty, Emmert, Meyer, Orfila, Magendie, and Jäger (Wibmer, *Wirk. d. Arzneim. ü. Gift.* Bd. i. S. 182), have shewn that it is a powerful poison to dogs, rabbits, wolves, and other animals. Thus eight, twelve, or eighteen grains of it, kill dogs, the symptoms being precisely the same as those of nux-vomica already detailed. Emmert (quoted by Christison) inferred, from experiments made on animals, that this bark acts on the spine directly, and not on that organ through the medium of the brain. (*b.*) *On man* it also acts as a powerful poison. Emmert (quoted by Wibmer, *Wirk. d. Arzneim. ü. Gift.* Bd. i. S. 188) mentions that a boy who had taken by mistake the decoction of this bark died therefrom. His intellectual powers were unaffected; he entreated his physician not to touch him, as violent convulsions were immediately brought on; he was powerfully sweated, but did not vomit. Prof. Marc was nearly poisoned by swallowing through mistake three quarters of a liqueur-glassful of a strong vinous infusion (*Journ. de Pharm.* t. ii. p. 507).

2. *Of the Seeds.* (*a.*) *On vegetables.*—Marcet (*Ann. Chim. et Phys.* t. xxix.) states, that a quarter of an hour after immersing the root of an haricot plant (Phaseolus vulgaris) in a solution of five grains of the extract of nux-vomica in an ounce of water, the petals became curved downwards, and in twelve hours the plant died. Fifteen grains of the same extract were inserted in the stem of a lilac tree, on July the 5th, and the wound closed. In 13 days the neighbouring leaves began to wither.

(*b.*) *On animals generally.*—Nux-vomica appears to be poisonous, in a greater or less degree, to all classes of animals. On the vertebrata its effects are very uniform, though larger quantities are required to kill herbivorous than carnivorous animals. Thus a few grains will kill a dog, but some ounces are required to destroy a horse (Moiroud, *Pharm. Vét.* p. 266). It occasions in all, tetanic convulsions, increased sensibility to external impressions, asphyxia, and death (Orfila, *Toxicol. Gén.*)

(*c*.) *On man.*—We shall establish three degrees of the operation of nux-vomica on man.

α. *First degree: tonic and diuretic effects.*—In very small and repeated doses, nux-vomica usually promotes the appetite, assists the digestive process, increases the secretion of urine, and renders the excretion of this fluid more frequent. In some cases it acts slightly on the bowels, and occasionally produces a sudorific effect. The pulse is usually unaffected. In somewhat larger doses, the stomach not unfrequently becomes disordered, and the appetite impaired.

β. *Second degree: rigidity and convulsive contraction of the muscles.*—In larger doses, the effects of nux-vomica manifest themselves by a disordered state of the muscular system. A feeling of weight and weakness in the limbs, and increased sensibility to external impressions (of light, sound, touch, and variations of temperature), with depression of spirits and anxiety, are usually the precursory symptoms. The limbs tremble, and a slight rigidity or stiffness is experienced when an attempt is made to put the muscles into action. The patient experiences a difficulty in keeping the erect posture, and, in walking, frequently staggers. If, when this effect is beginning to be observed, he be tapped suddenly on the ham while standing, a slight convulsive paroxysm is frequently brought on, so that he will have some difficulty to prevent himself from falling. I have often in this way been able to recognize the effect of nux-vomica on the muscular system, before the patient had experienced any particular symptoms.

If the use of the medicine be still persevered in, these effects increase in intensity, and the voluntary muscles are thrown into a convulsed state by very slight causes. Thus, when the patient inspires more deeply than usual, or attempts to walk, or even to turn in bed, a convulsive paroxysm is brought on. The sudden contact of external bodies also acts like an electric shock on him. The further employment of nux-vomica increases the severity of the symptoms; the paroxysms now occur without the agency of any evident exciting cause, and affect him even when lying perfectly quiet and still in bed. The muscular fibres of the pharynx, larynx, œsophagus, and bladder, also become affected, and Trousseau and Pidoux (*Traité de Thérap.* t. i. p. 515) say those of the penis are likewise influenced, and the nocturnal and diurnal erections become inconvenient even in those who, for some time before, had lost somewhat of their virility. I am acquainted with two cases of paralysis, in which the use of nux-vomica caused almost constant nocturnal erection. Females also, say Trousseau and Pidoux, experience more energetic venereal desires; and "we have," they add, "received confidential information on this point, which cannot be doubted."

The pulse does not appear to be uniformly affected; for the most part it is slightly increased in frequency between the convulsive attacks, but Trousseau says he has found it calm even when the dose of the medicine was sufficient to cause general muscular rigidity. Previous to the production of the affection of the muscles, various painful sensations are oftentimes experienced in the skin, which patients have compared to the creeping of insects (formication), or to the passage of an electric shock; and occasionally an eruption makes its appearance.

It is remarkable that in paralysis the effects of nux-vomica are principally observed in the paralysed parts. Dr. M. Hall (*Lect. on the Nerv.*

Syst.) ascribes this to the irritability being greater in the inactive than in the active limb. Hence, though the strychnia act equally through the true spinal system, it produces the most marked effects upon the most irritable muscles. Magendie (*Formul.* p. 7, 8^{me} éd.) states, he has observed sweating confined to the paralyzed parts. "I have seen," says this physiologist, "the affected side covered with an anomalous eruption, while the opposite side was free from it. One side of the tongue is sometimes sensible of a very bitter taste, which is not perceptible to the other side."

γ. *Third degree: tetanus and asphyxia.*—I think I cannot do better than relate a case of poisoning by nux-vomica reported by Mr. Ollier (*Lond. Med. Repos.* vol. xix. p. 448), in order to illustrate the third and most violent degree of operation of this drug. A young woman swallowed between three and four drachms of this substance in powder, and in half an hour was seen by Mr. Ollier. She was sitting by the fire, quite collected and tranquil; her pulse about 80, and regular. He left her for about ten minutes to procure an emetic, and on his return found that she had thrown herself back in her chair, and that her legs were extended and considerably separated. She was perfectly sensible, and without pain, but seemed in alarm, laid hold of her husband's coat, and entreated him not to leave her. A perspiration had broken out on her skin, her pulse had become faint, and much quicker, and she called frequently for drink. She then had a slight and transient convulsion. Recovering from it, she was in great trepidation, kept fast her hold of her husband, and refused to let him go, even for the alleged purpose of getting her drink. In a few minutes after, she had another, and a more violent attack, and shortly afterwards, a third: the duration of these was from a minute and a half to two minutes. In them she retained her grasp; her whole body was straightened and stiffened, the legs pushed out and forced apart. I could not (says Mr. Ollier) perceive either pulse or respiration; the face and hands were livid, the muscles of the former, especially of the lips, violently agitated, and she made constantly a moaning, chattering noise. She was not unlike one in an epileptic fit, but did not struggle, though, as she was forced out, it was difficult to keep her from falling on the floor.

In the short interval of these attacks she was quite sensible; was tormented with incessant thirst; perspired; had a very quick and faint pulse; complained of being sick, and made many attempts to vomit. (I should state she had swallowed some ipecacuanha powder to evacuate the poison). She continued to refuse to let her husband move, and to the question whether she was in pain, replied, "No—no—no!"

A fourth and most vehement attack soon followed, in which the whole body was extended to the utmost, and she was rigidly stiff from head to foot, insomuch that, with all the force of the surgeon, he could not bend her thighs on the pelvis to replace her in her seat. From this she never recovered; she fell into a state of asphyxia, and never breathed again. She now relaxed her grasp; her discoloured hands dropped upon her knees; her face, too, was livid; the brows contracted; the lips wide apart, shewing the whole of the closed teeth, and a salivary foam issued plentifully from the corners of her mouth. The expression of the whole countenance was at this time very frightful. On removal of the body, it was discovered that the urine had been discharged. She died in about an hour after taking the poison. Five hours afterwards, she was still a straight and stiff as a statue; if you lifted one of her hands, the whole body moved with it, but the face had become pale in comparison, and its expression more placid.

Post-mortem Appearances.—In the case just related the body was observed to be rigid after death, but in the lower animals the reverse is generally noticed. As in other cases where death takes place from obstructed respiration, venous congestion is observed. Occasionally there is redness or inflammation of the alimentary canal, and now and then softening of the brain or spinal cord.

Modus Operandi.—There are several points connected with the modus operandi of nux-vomica which require investigation:—

1st. *Is this seed a local irritant?*—In medicinal doses it does not usually disorder the stomach, nor is it invariably irritant in its operation, even when swallowed as a poison. In some instances, however, the pain and heat in the stomach, the burning in the gullet, and the nausea and vomiting, are evidences of its local action; and, in several cases, marks of inflammation have been observed in the stomach on examination of the body after death. Strychnia also is a local irritant.

2nd. *On what part of the body does nux-vomica exercise a specific effect?*—The symptoms clearly indicate the nervous system to be specifically affected; and as the voluntary muscles are supplied with nervous influence from the cerebro-spinal portion of the nervous system, it is presumed that it is on this portion that nux-vomica exerts its principal or sole influence. Physiologists, however, have endeavoured to ascertain what part of the cerebro-spinal system was principally affected. Now the tetanic symptoms, and the absence of narcotism, have led to the conclusion that the spinal cord was the seat of the disease—a conclusion supported by the fact, that the division of this cord, nay, even complete decollation, will not prevent the poisonous effects of nux-vomica; whereas the destruction of the cord by the introduction of a piece of whalebone into the spinal canal, causes the immediate cessation of the convulsions; and if only part of the cord be destroyed, the convulsions cease in that part of the body only which is supplied with nerves from the portion of medulla destroyed. These facts, then, originally observed by Magendie, and which I have myself verified, lead to the conclusion, that the abnormal influence, whatever it may be, which causes the convulsions to take place, is not derived from the contents of the cranium, but from the medulla spinalis itself. Moreover, as the motor nerves seem principally affected, it has been presumed, that the disorder is seated in the anterior columns of the cord; but the white fibres of the nervous system are merely the conductors of nervous power, the gray matter being apparently the source of it (Grainger, *Struct. and Funct. of the Spinal Cord*, p. 17). Hence, then, the seat of the operation of nux-vomica is the seat of the reflex functions (Dr. M. Hall, *Lect. on the Nerv. Syst.*) The increased susceptibility to external impressions produced by strychnia also depends, according to Dr. Stannius (*Brit. and For. Med. Rev.* vol. v. p. 221), on the primary action of this substance on the spinal marrow. The same physiologist concludes from his experiments on frogs, that the centripetal nerves receive, from the spinal cord, an increase of their excitability; and that thus charged, they react upon the medulla, and occasion the peculiar convulsions.

M. Flourens (*Rech. Expér. sur les Fonct. du Syst. Nerv.* 1824) asserted, that the part of the nervous system on which nux-vomica more particularly acted was the medulla oblongata. But MM. Orfila, Ollivier, and Drogartz (*Arch. Gén. de Méd.* viii. 22), in their report on a case of poisoning by this substance, particularly mention that they observed no traces of alteration in the condition of the medulla oblongata, the tuber annulare, or the crura cerebri, which is in opposition to Flourens' opinion; for he asserted, that the specific or exclusive action of each substance on each organ, always left, after death, traces of its action sufficient to distinguish the affected from other organs.

But it may be asked, is the cerebrum unaffected by nux-vomica? I think we are hardly justified in replying to this in the affirmative. It is, indeed, true that the intellectual functions are not usually much disordered by this drug, but the mental anxiety commonly experienced by persons under its use, the occasional appearance of stupor, and the observations of Andral and Lallemand on the injurious effects of it in some apoplexies, leave no doubt that, occasionally at least, the cerebrum is affected. Bally (*Brit. and For. Med. Rev.* vol. vi. p. 225) has observed an appearance of stupor, vertigo, tinnitus aurium, sleeplessness, and turgescence of the capillaries of the face, result from the use of strychnia.

The cerebellum is said, by some, to be acted on by nux-vomica, but for the most part on hypothetical grounds, though it must be mentioned that MM. Orfila, Ollivier, and Drogartz, observed the cerebellum presented more evidences of lesions than the other parts of the nervous system. Another argument, which probably would be advanced by phrenologists in favour of the affection of the cerebellum by this drug, is the observation of Trousseau, that the sexual feelings are usually excited by it.

Segalas (quoted by Dr. Christison) found, in his experiments on animals, that in some cases life could not be prolonged by artificial respiration, and that after death the heart could not be stimulated to contract. These and other reasons seem to show, that nux-vomica exhausts the irritability of the heart. But in all probability this viscus is affected only secondarily, the essential and primary action being on the nervous system.

3rd. *What kind of action does nux-vomica set up in those parts of the nervous system on which it acts?*—As the muscles receive from the nervous system a preternatural stimulus to action, it is presumed that this system (or at least certain parts of it) is in a state of excitement or irritation. In one case, mentioned by Mr. Watt (Christison, p. 803), there was observed softening of the lumbar portion of the spinal cord; and in the case reported by MM. Orfila, Ollivier, and Drogartz, the whole cortical substance of the brain, especially of the cerebellum, was softened. Andral and Lallemand have both observed that this remedy, in some forms of apoplexy, produced symptoms indicating ramollissement.

4th. *Does nux-vomica or its active principles become absorbed?*—Several reasons, some of which have been before alluded to (see pp. 16, 17, 18, 19, 20), may be adduced in favour of the affirmative of this question. Thus the blood of animals under the influence of this poison has been found to be poisonous (though Messrs. Morgan and Addison deny that this was the case in their before-mentioned experiment, p. 21). Moreover, the activity of this drug seems to be in the ratio of the absorbing power of the part.

5th. *Is any change produced in the blood-discs by strychnia?*—Müller

(*Physiol.* by Baly, vol. i. p. 107) says, strychnia produces no change in them; and Dr. Stannius (*Brit. and For. Med. Rev.* vol. v. p. 222) was unable to detect, by means of the microscope, any alteration in the appearance of the blood of frogs poisoned by strychnia.

6th. *In what manner is death produced by nux-vomica?*—Frequently by the stoppage of respiration, in consequence of the spasmodic condition of the respiratory muscles (see p. 69). In other cases, death seems to arise from excessive exhaustion of the nervous power (see Cloquet's case, quoted by Christison, p. 801).

3. *Of Strychnia.*—The effects of strychnia are of the same kind as those of nux-vomica, but more violent in degree. As ordinarily met with in the shops, it may be regarded as about six times as active as the alcoholic extract of nux-vomica. The following are a few examples of its poisonous operation:—

(*a.*) *On animals.*—Dr. Christison (*Treat. on Poisons*, p. 797, 3rd ed.) says, "I have killed a dog, in two minutes, with a sixth part of a grain, injected, in the form of alcoholic solution, into the chest: I have seen a wild boar killed, in the same manner, with a third of a grain, in ten minutes." Pelletier (*Ann. de Chim. et Phys.* x. 172) says, "half a grain, blown into the mouth of a dog, produced death in five minutes." Half a grain, applied to a wound in the back of a dog, caused death in three minutes and a half. In all these and other instances death was preceded and accompanied by tetanus. The salts of strychnia act in a similar manner.

(*b.*) *On man.*—Some individuals are more susceptible of the action of strychnia than others. Andral (Bayle, *Bibl. Thérap.* t. ii. p. 227) has seen a single pill, containing one-twelfth of a grain, cause slight trismus, and the commencement of tetanic stiffness of the muscles; while in other cases the dose may be gradually increased beyond a grain, with comparative little effect. The largest dose I have given is a grain and a half, and this was repeated several times before the usual symptoms, indicative of the affection of the system, came on.

The local action of strychnia is that of an irritant. Applied to the naked dermis, it causes burning and pungent pain, lasting from half an hour to an hour; and where blisters have been applied, the raw surface inflames under the use of the remedy, and affords a copious suppuration (Ahrensen, *Brit. and For. Med. Rev.* vol. v. p. 350).

4. *Of Brucia.*—The effects of brucia on man and animals appear to be precisely similar to those of strychnia, though larger doses are required to produce them. Magendie (*Formul.*) considers it to possess only one-twelfth the activity of strychnia; while Andral regards it as having one-sixth the power of impure strychnia, and one twenty-fourth that of pure strychnia.

Uses.—The obvious indications for the use of nux-vomica, strychnia, or brucia, are torpid or paralytic conditions of the muscular fibre; while these agents are contra-indicated in spasmodic or convulsive diseases. Experience, however, has fully proved that when paralysis depends on inflammatory conditions of the nervous centres, these agents prove injurious, and accelerate organic changes.

1. *In paralysis.*—Of all the diseases for which nux-vomica has been employed, in none has it been so successful as paralysis; and it is deserving of notice, that this is one of the few remedies whose discovery is

not the effect of mere chance, since Fouquier (Bayle, *Bibl. Thérap.* t. iii p. 141) was led to its use by legitimate induction from observation of its physiological effects. That a remedy which stimulates so remarkably the muscular system to action should be serviceable when that system no longer receives its accustomed natural stimulus is, *à priori*, not astonishing. Paralysis, however, is the common effect of various lesions of the nervous centres, in some of which nux-vomica may be injurious, in others useless, and in some beneficial. It is, therefore, necessary to point out under what circumstances this remedy is likely to be advantageous or hurtful.

A very frequent, and, indeed, the most common cause of paralysis, is hemorrhage of the nervous centres. Blood may be effused on the external surface of these centres, into their cavities, or in their substance: the latter being by far the most common case—in the proportion, according to Andral (*Path. Anat.* by West, vol. ii. p. 722) of 386 out of 392 instances of cerebral hemorrhage. It is superfluous for me to say that the radical cure of these cases can be effected only by the removal (that is, absorption) of the effused blood. Now the process by which this is effected is almost entirely a natural one: art can offer no assistance of a positive kind, though by the removal of impeding causes she may be at times negatively useful. Nux-vomica can, in such cases, be of no avail: on the contrary, it may be injurious.

The part immediately surrounding the sanguineous clot is usually much softened, a condition formerly regarded as the effect of the effusion. But Lallemand has satisfactorily shewn that it often, though not invariably, precedes the hemorrhage. This softening, or *ramollissement*, is, according to the same authority, a constant and necessary result of an acute or chronic irritation. But the facts at present known do not warrant this generalization, since cases occur which apparently are unconnected with irritation. For this softening art can do but little; we have, in fact, no particular or uniform treatment. If we can connect with it any increased vascular action, of course blood-letting and the other antiphlogistic means are to be resorted to; whereas, if the reverse condition of system exist, marked by great languor and debility, tonics and stimulants may be administered. Nux-vomica in these cases offers no probability of benefit; on the contrary, we might suspect, that as it irritates the spinal cord, it might probably have the same effect on the brain, and hasten the production of softening. Now experience seems to confirm our theoretical anticipations. Andral (Bayle, *Bibl. Thérap.* t. iii p. 227) relates the case of a man who was hemiplegic, in consequence of an old apoplectic attack. A pill containing only one-twelfth of a grain of strychnia (the active principle of nux-vomica), was given him, and it produced a strong tetanic stiffness of the paralysed members. The following day he complained of pain in the head, on the side opposite to that paralysed; his intellectual functions were weaker, and his hemiplegia was increased; in fact, he had all the symptoms characterising softening of the brain. It is, therefore, probable that the strychnia set up an inflammatory condition of the nervous substance around the apoplectic deposit, and that this condition was the precursor of ramollissement. When, therefore, nux-vomica is employed in those cases of paralysis which are connected with inflammation of the brain or spinal marrow, it is very likely to increase the evils it is intended to mitigate. Lallemand (*Recherches anatomico-pathologiques sur l'Encéphale*, p. 267, 1820) reports two cases in which this drug, administered against cerebral maladies, occasioned convulsive movements, which continued until death. On opening the bodies, the cerebral substance surrounding the sanguineous clot was found disorganised and exceedingly softened. These facts suggest some useful reflections as to the use of this powerful drug in paralysis, and prevent its indiscriminate use in all cases of this disease.

But there are cases in which paralysis, arising from cerebral hemorrhage, may be advantageously treated by nux-vomica. The blood which is poured out in the apoplectic cell has at first a gelatinous consistence, some of it still remaining fluid. "Somewhat later," says Andral (*Path. Anat.* by West, vol. ii. p. 723), "twelve or fifteen days after the attack, for instance, the coagulum is found to be firmer and more circumscribed; later still, it becomes white or yellow, and is surrounded by a brownish-red fluid. The walls of the containing cavity are smooth, and lined with a delicate membrane. The surrounding cerebral substance in some cases retains its natural appearance, and in others is altered both in colour and consistence. As the interval between the effusion and the examination increases, the coagula gradually disappear." The cyst is now found to contain a serous fluid, occasionally having a few cellular bridles running from one side to the other; and nature subsequently attempts to get rid of the cyst by producing adhesion of its sides, leaving only a linear cicatrix. Now it is well known, that by long disuse of some of the voluntary muscles, the power over them becomes gradually diminished; and it appears that occasionally in cerebral hemorrhage, after the absorption of the effused blood, the paralysis remains, as it were by habit. In these cases the cautious employment of nux-vomica, or of its active principle, may be attended with beneficial results, by favouring the return both of motion and sensation.

But paralysis, like some other diseases of the nervous system, may exist without our being able to discover after death any lesion of the nervous centres; and it is then denominated a functional disorder, as if there were actually no organic lesion. To me, however, the fact of the lesion of action is a strong ground for suspecting that there must have been an organic lesion of some kind, though we see nothing. "It is highly probable," says Andral (*Ibid.* p. 709), "that some organic lesions do exist in such cases, though they escape our notice." Be this as it may, experience has fully established the fact, that nux-vomica is more beneficial in those forms of paralysis usually unaccompanied with lesions of structure; such, for example, as paralysis resulting from exposure to the influence of lead and its various compounds. Thus, of ten cases of saturnine hemiplegia, treated by nux-vomica or its active principles, and which are mentioned by Bayle, three were cured, and three ameliorated.

As hemiplegia more frequently depends on cerebral hemorrhage than some other forms of paralysis, so it is, for the most part, less amenable to remedial means. Thus, while out of twenty-six cases of paraplegia, nineteen were cured by nux-vomica or its active constituents, yet in thirty instances of hemiplegia only thirteen were cured. In six cases of general paralysis (that is, paralysis of both sides at once), four were cured by this remedy. In the paralysis which sometimes affects the muscles of certain organs, nux-vomica (or strychnia) has been employed with advantage. Thus a case of amaurosis, accompanied with paralysis of the eye-lid, is said to have been cured by it; and several cases of incontinence of urine, depending on paralysis, or diminished power of the muscular fibres of the bladder, have also been benefited by the same means. In some cases of local paralysis strychnia has been employed endermically with benefit.

2. *Paralysis of the Sentient Nerves.*—The good effects procured from the use of nux-vomica in paralysis of the motor nerves, have led to its employment in functional lesions of sentient nerves, characterised by torpor, inactivity, and paralysis. That benefit may be obtained in these cases is physiologically probable, from the circumstance that one of the effects of this agent is an exaltation of the susceptibility to external impressions, as I have before mentioned. Hitherto, however, the trials have not been numerous, nor remarkably successful. In *amaurosis* benefit has been obtained in some few instances; and where no organic lesion is appreciable, this remedy deserves a trial. The endermic method of using it has been preferred. Small blisters, covered with powdered strychnia, have been applied to the temples and eyebrows. The remedy causes sparks to be perceived in both eyes, especially the affected one; and it is said, the more of these, the better should be the prognosis: moreover, the red-coloured sparks are thought more favourable than sparks of other colours. When the malady is complicated with disease of the brain, the remedy must be employed with extreme caution.

3. *Other Affections of the Nervous System.*—I have seen nux-vomica very serviceable in shaking or *tremor of the muscles* produced by habitual intoxication. A gentleman thus affected, who had for several weeks lost the power of writing, reacquired it under the use of this medicine. *Chorea* has been benefited by it (Magendie, *Formul.*) Several cases of *epilepsy* are likewise said to have been relieved by it (Bayle, *Bibl. Thérap.* t. ii. pp. 135 and 230): but, judging from its physiological effects, it would appear to be calculated to act injuriously, rather than beneficially, in this disease; and in one case (*Ibid.* p. 233) the use of strychnia apparently caused paralysis and death. It has also been employed in *hypochondriasis* and *hysteria* (*Ibid.* p. 134).

4. *Affections of the Alimentary Canal.*—On account of its intense bitterness, nux-vomica has been resorted to as a tonic and stomachic in *dyspepsia*, especially when this affection depends on, or is connected with, an atonic condition of the muscular coat of the stomach. In *pyrosis*, resulting from simple functional disorders of the stomach, Mr. Mellor (*Lond. Med. Gaz.* xix. p. 851) considers it to be almost a specific. Even when pyrosis is symptomatic of organic disease of the stomach, he says it is of essential service. In febrile states of the system, its use is contra-indicated. Dr. Belcombe (*Ibid.* p. 964) has confirmed these statements, and also speaks of its good effects in *gastrodynia*. In *dysentery*, particularly when of an epidemic nature, nux-vomica has gained some reputation. Hagstrom says, he has proved its value in some hundreds of cases (Bayle, *op. cit.* p. 135); and his report has been confirmed by Hufeland (*Ibid.* p. 136), Geddings (*Brit. and For. Med. Rev.* vol. i. p. 255), and others. In *colica pictonum*, a combination of strychnia and hydrochlorate of morphia has been found, by Bally, highly successful.

(*Ibid.* vol. vi. p. 225). In *prolapsus of the rectum*, Dr. Schwartz (*Lond. Med. Gaz.* vol. xvi. p. 768) has recommended the use of this remedy, which he has employed for ten years, both in adults and children, with great benefit. One or two grains of the alcoholic extract are to be dissolved in two drachms of water; and of this solution he gives to suckling infants two or three drops; older children from six to ten or fifteen drops, according to their age.

5. *In impotence.*—The excitement of the sexual feelings, which Trousseau has seen produced by nux-vomica, led him to employ this remedy against impotence, and he has found it successful both in males and females. In some cases, however, its good effects were observed only while the patients were taking the medicine. A young man, twenty-five years of age, of an athletic constitution, who had been married for eighteen months without having any other than almost fraternal communications with his wife, acquired his virility under the use of nux-vomica, though he again lost it soon after leaving off its employment.

The preceding are the diseases in which nux-vomica has proved most successful. It has, however, been used in several others (as *intermittent fevers*, *intestinal worms*, &c.) with occasional benefit.

ADMINISTRATION.—Nux-vomica is used in the form of *powder*, *tincture*, or *extract*. *Strychnia* and *brucia* may be regarded as other preparations of it. The *powder* of nux-vomica is administered in doses of two or three grains gradually increased. Fouquier has sometimes increased the quantity to fifty grains.

1. *Tinctura Nucis-vomicæ*, D.—(Nux-vomica, scraped, ℥ij.; Rectified Spirit, ℥viij. Macerate for seven days, and filter). Dose, ♏v to ♏x. It is sometimes used as an embrocation to paralysed parts, and its good effects in this way seem to be increased by combining it with ammonia.

2. *Extractum Nucis-vomicæ*, E. D.—("Take of nux-vomica any convenient quantity; expose it in a proper vessel to steam till it is properly softened; slice it, dry it thoroughly, and immediately grind it in a coffee-mill; exhaust the powder either by percolating it with rectified spirit, or by boiling it with repeated portions of rectified spirit, until the spirit comes off free of bitterness. Distil off the greater part of the spirit; and evaporate what remains in the vapour-bath to a proper consistence," *E.*—The *Dublin College* order of Nux-vomica, scraped, ℥viij.; Proof Spirit, Oij. [wine measure]. Digest in a close vessel for three days, filter the liquor, and express what remains by a press; to this add a pint and a half of proof spirit, digest the mixture for three days, and express the residuum: consume the mixed liquors by distillation, to a fourth part, and reduce to a proper consistence. By the Dublin process the produce of extract is about 9 per cent. (Barker and Montgomery, *Observ. on the Dubl. Pharm.* p. 526). Dose, gr. ss., gradually increased to two or three grains. The extract is given in the form of pill.

3. *Strychnia*, L. E.—The directions of the *London College* for preparing this alkali are as follows:—

"Take of Nux-vomica, bruised, lb. ij.; Rectified Spirit, *Cong.* iij.; Diluted Sulphuric Acid; Magnesia; Solution of Ammonia, each as much as may be sufficient. Boil the bruised nux-vomica with a gallon of the spirit for an hour in a retort, to which a receiver is fitted. Pour off this liquor, and again a third time boil what remains with another gallon of spirit, and the spirit recently distilled, and pour off the liquor. Press the nux-vomica, and let the spirit distil from the mixed and strained liquors. Evaporate what remains to the proper consistence of an extract. Dissolve this in cold water, and strain. Evaporate the liquor with a gentle heat, until it has the consistence of syrup. To this, while yet warm, gradually add the magnesia to saturation, shaking them together. Set it aside for two days, then pour off the supernatant liquor. Press what remains wrapped in cloth. Boil it in spirit, then strain, and let the spirit distil. Add to the residue a very little diluted sulphuric acid mixed with water, and macerate with a gentle heat. Set it aside for twenty-four hours, that crystals may form. Press and dissolve them. Afterwards to these, dissolved in water, add ammonia, frequently shaking them, that the strychnia may be thrown down. Lastly, dissolve this in boiling spirit, and set it aside that pure crystals may be produced."

The directions of the *Edinburgh College* are as follows:—

"Take of Nux-vomica, lb. j.; Quicklime, ℥iss; Rectified Spirit, *a sufficiency*. Subject the nux-vomica for two hours to the vapour of steam, chop or slice it, dry it thoroughly in the vapour-bath or hot air-press, and immediately grind it in a coffee-mill. Macerate for twelve hours in two pints of water, and boil it; strain through linen or calico, and squeeze the residuum; repeat the maceration and decoction twice with a pint and a half of water. Concentrate the decoctions to the consistence of thin syrup; add the lime in the form of milk of lime; dry the precipitate in the vapour-bath; pulverize it, and boil it with successive portions of rectified spirit till the spirit cease to acquire a bitter taste. Distil off the spirit till the residuum be sufficiently concentrated to crystallize on cooling. Purify the crystals by repeated crystallization."

The following is the rationale of the process of the *London Pharmacopœia:* the watery solution of the alcoholic extract contains the *strychnate of strychnia:* the magnesia decomposes this, and by abstracting the strychnic acid sets free the strychnia.

RE-AGENTS.		PRODUCTS.
Magnesia		Strychnate of Magnesia.
Strychnate of Strychnia	Strychnic acid	
	Strychnia	Strychnia.

The strychnia is dissolved by the alcohol, and is left after distillation. Dilute sulphuric acid dissolves it, forming a sulphate, and from the sulphatic solution ammonia throws it down.

RE-AGENTS.		PRODUCTS.
Ammonia		Sulphate of Ammonia.
Sulphate of Strychnia	Sulphuric Acid	
	Strychnia	Strychnia.

The strychnia is then dissolved in boiling spirit; and from the solution crystals are obtained, by cooling and evaporation.

In the process of the *Edinburgh Pharmacopœia*, a decoction of nux-vomica is prepared: this contains the strychnate of strychnia with gum. This salt is decomposed by the lime, and the strychnia abstracted by rectified spirit.

In the preceding account I have omitted, for the sake of perspicuity, all notice of the brucia which is associated with the strychnia. The physical and chemical properties of strychnia have been before described (p. 908).

The *dose* of strychnia or its *salts* (*acetate*, *sulphate*, *nitrate*, or *hydrochlorate*) is, at the commencement, one-sixteenth or one-twentieth of a grain, which is to be gradually increased until its effects on the muscular system are observed. The largest dose I have ever seen attained is one grain and a half. Two scruples, taken to cause self-destruction, produced death in an hour and a half (*Lancet*, Jan. 27, 1838, p. 647). Strychnia is usually given in the form of *pill* (made with common conserve of roses), or it may be dissolved in *alcohol* or *acetic acid*. The *endermic* dose of strychnia should not, at the commencement, exceed half a grain, and of its salts one-fourth of a grain.

4. *Brucia*. (Obtained from nux-vomica bark).—Dose, half a grain, which is to be gradually increased to five grains. It may be given in the same way as strychnia.

Antidote.—Evacuate the contents of the stomach as speedily as possible. No chemical antidotes are known. Probably astringents (as infusion of galls, green tea, &c.) would be serviceable. Donné (*Journ. de Pharm.* t. xvi. p. 377) regards chlorine, iodine, and bromine, as antidotes for strychnia and brucia; but further evidence is required to establish the correctness of his inferences. Emmert (Buchner, *Toxikol.* S. 235-6) says that vinegar and coffee increased the poisonous effects of nux-vomica (false angustura) bark. To relieve the spasms, narcotics may be employed. Sachs and others have recommended opium. As conia is the counterpart of strychnia, it deserves a trial. I applied it to a wound in a rabbit affected with tetanus from the use of strychnia: the convulsions ceased, but the animal died. In the absence of conia, the extract of hemlock should be employed. Ether and oil of turpentine has been recommended (Phœbus, *Hülfsleist bei acut. Vergift.* S. 14). To relieve the excessive endermic operation of strychnia, acetate of morphia applied to the same spot has given relief.

Other Medicinal or Poisonous Apocynaceæ.

The seeds of *Strych'nos Igna'tia*, or *St. Ignatius's beans*, came into the Dutch shops, according to Alston (*Lect. on the Mat. Med.* vol. ii. p. 38), about the latter end of the seventeenth century. But there is some reason to suspect that they were known long before this, and are probably the substances which, in the Latin translation of Serapion, were denominated *nuces vomicæ*. Dale (*Pharmacol.* p. 328) gives, as one of their synonymes, " Igasur, seu Nux vomica legitima Serapionis." They are obtained from the Strychnos Ignatia (called by some Ignatia amara), a tree indigenous to the Philippine Islands, whose fruit is smooth and pyriform, and contains about twenty seeds. These seeds, the St. Ignatius's beans of the shops, are about the size of olives, rounded and convex on one size, and somewhat angular on the other. Externally they are brownish, with a bluish gray tint. Within the envelopes of the seed is a very hard, horny, or cartilaginous albumen, in whose cavity is contained the embryo. These seeds have been analysed by MM. Pelletier and Caventou (*Ann. de Chim. Phys.* x. 147), who found their constituents to be the same as those of nux-vomica, though in somewhat different proportions. Their effects, therefore, are similar.

Strych'nos Tie'uté, the *Tshettik* or *Tjettek*, is a large climbing shrub, growing in Java. The aqueous extract of the bark of this tree is the poison called *Upas tieuté*, *Tjettek*, or *Upas Radja*, and which must not be confounded with the poison of the *Antiaris toxicaria*, before described (see p. 747). The Upas tieuté was analyzed by Pelletier and Caventou (*Ann. de Chim. Phys.* xxvi. 44), who found it to consist of *strychnia combined with an acid* (igasuric?), *a reddish brown colouring matter*, which becomes green when mixed with nitric acid, and a soluble *yellow colouring matter*, which is reddened by nitric acid. They could detect no brucia. The effects of this poison are precisely similar to those of nux-vomica and strychnia. Thus, when applied to wounds, injected into the serous sacs or blood-vessels, or applied to the mucous membrane, it produces tetanus, asphyxia, and death. Forty drops of upas dissolved in water, and injected into the pleura of an old horse, gave rise almost immediately to tetanus and asphyxia, and the animal died after the second attack.

Ligna Colubrina, or Snake-woods.—In countries infested with poisonous serpents, the natives have usually some substance which is fancied to possess the power of preserving them from the bites of these poisonous animals; and thus we have various articles, seeds, roots, and woods, which have the word *snake* affixed to them.

In Asia there are several kinds of *lignum colubrinum*, or *snake-wood*, supposed to be possessed of the above-mentioned property. The specimens, however, met with in commerce, shew that there are various substances to which this term is applied; some being the wood of a stem, others of a root. The most esteemed is the wood of the *Strych'nos Colubri'na*. The *S. ligustri'na* yields the ancient *lignum colubrinum* of *Timor*. Pelletier and Caventou (*Ann. de Chim. Phys.* x. 170) analyzed one of these woods, and found that it had the same constituents as the bean of St. Ignatius, though in different proportions. Thus it contained more fatty and colouring matter, less strychnia, and, in the place of bassorine and starch, a larger quantity of woody fibre. Its action, therefore, is precisely similar to the before-mentioned poisons.

Strych'nos toxif'era, Schomb. yields the basis of the celebrated *Wooraly*, *Woorari*, *Ourari*, or *Urari* poison of Guayana, which produces paralysis with convulsive movements, death from, apparently, suspended respiration: hence artificial respiration is a most important means of relief (Brodie, *Phil. Trans.* for 1811, p. 178; and Waterton, *Brit. and For. Med. Rev.* vol. viii. p. 597). Dr. Hancock (*Lond. Med. Gaz.* vol. xx. p. 281) used the bark of this plant as an application to foul ulcers.

The seeds of *Strychnos potatorum*, or *clearing nuts*, are used in India to clear muddy water (Roxburgh, *Fl. Ind.* vol. i. p. 575).

The bark of the *Strych'nos Pseudoqui'na*, called *Quina do Campo*, is employed in the Brazils as a substitute for cinchona bark. It does not possess poisonous properties. It was analyzed by Vauquelin (*Mém. du Muséum*, 1823, p. 452), who discovered neither strychnia nor brucia in it. Mercadieu (*Journ. de Chem. Méd.* t. i. p. 236 *bis*) also analyzed it, under the erroneous name of *copalchi* (see p. 777), and could not discover any vegetable alkali in it. The internal surface of the bark (liber), touched by nitric acid, becomes red, while the external surface becomes blackish green (Guibourt, *Journ. de Pharm.* t. xxv. p. 709). In these characters, then, it agrees with nux-vomica bark. Two other barks (also belonging to *Apocynaceæ*)—viz. the *pereira bark* (obtained from a species of *Valle'sia*) and the *casca d'anta* (procured from a *Rauwol'fia*)—likewise become red by contact with nitric acid. Pfaff (*Berl. Jahrb.* Bd. xlii. S. 95) has discovered a new alkali (called *pereirin*) in the pereira bark.

FIG. 185.

Cerbera Tanghin.

Cer'berin Tang'hin, or *Tanghin'ia venenif'era*, is a native of Madagascar. The kernel is a most deadly poison. Though not larger than an almond [with the shell], it is said to be capable of destroying twenty persons. It was analysed by O. Henry and Ollivier (*Journ. de Pharm.* t. x. p. 49). The active principle is a neutral crystalline principle, called *tanghicin* (*tangin-camphor*, Gmelin). The extractive (*tanginin*; *tanguine*, Gmelin) is also said to possess narcotic properties. The tanghin seed causes convulsions and violent efforts to vomit. It is (or was) used, in Madagascar, to ascertain the guilt of suspected persons: those who are able to withstand the ordeal are considered innocent; and, *vice versâ*, those who die are said to be guilty (Hooker, *Bot. Mag.* t. 2968).

ORDER 42. OLEA'CEÆ, *Lindley*.—THE OLIVE TRIBE.

OLEINEÆ, *R. Brown*.

ESSENTIAL CHARACTER.—*Flowers* hermaphrodite, sometimes diœcious. *Calyx* monophyllous, divided, persistent, inferior. *Corolla* hypogynous, monopetalous, four-cleft, occasionally of four petals connected in pairs by the intervention of the filaments, sometimes without petals; *æstivation* somewhat valvate. [*Fraxinus* is generally apetalous]. *Stamens* two, alternate with the segments of the corolla or with the petals; anthers two-celled, opening longitudinally. *Ovary* simple, without any hypogynous disk, two-celled; the *cells* two-seeded; the ovules pendulous and collateral; *style* 1 or 0; *stigma* bifid or undivided. *Fruit* drupaceous, berried, or capsular, often by abortion one-seeded. *Seeds* with dense, fleshy, abundant albumen; *embryo* about half its length, straight; *cotyledons* foliaceous, partly asunder; *radicle* superior; *plumule* inconspicuous.—*Trees* or *shrubs*. *Branches* usually dichotomous and ending abruptly by a conspicuous bud. *Leaves* opposite, simple, sometimes pinnated. *Flowers* in terminal or axillary racemes or panicles; the *pedicels* opposite with single bracts (R. Brown).

PROPERTIES.—Not very remarkable. The barks of some species are tonic and astringent. Manna is obtained from several species.

O'lea europæ'a, Linn. L. E. D.—*The European Olive.*

Sex. Syst. Diandria, Monogynia.

(Oleum è drupis expressum, *L.*—Expressed oil of the pericarp, *E.*—Oleum ex fructu, *D.*)

HISTORY.—Few vegetables have been so repeatedly noticed and enthusiastically described by the ancient writers as the olive-tree. In all ages it seems to have been adopted as the emblem of benignity and peace. It is frequently mentioned in the Bible (as *Gen.* ch. viii. v. 12); the ancient Greeks (Homer, *Od.* v. 477) were well acquainted with it; and several products of it were employed in medicine by Hippocrates (Dierbach, *Arzneim. d. Hippocr.* p. 77). Pliny (*Hist. Nat.* lib. xv. cap. 1—8; and lib. xxiii. cap. 34—37, ed. Valp.) is most diffuse in his account of it.

BOTANY. *GEN. CHAR.*—*Calyx* small, four-toothed. Tube of the *corolla* short; limb four-cleft. *Stamens* two. Segments of the *stigma* emarginate. *Drupe*, with a two-celled, two-seeded—by abortion one-celled, one-seeded—nut (*Bot. Gall.*)

SP. CHAR.—*Leaves* lanceolate, quite entire; their surfaces differently coloured. *Racemes* panicled.

FIG. 186.

Olea europæa.

A long-lived *tree* of slow growth. *Wood* hard; used for cabinet-work. *Leaves* in pairs, shortly petioled, lanceolate, acute, green above, hoary beneath. *Flowers* small and white. *Drupe* elliptical, dark bluish green; kernel (*pyrena*) hard, with usually only one ovule. The whitish character of the foliage gives a dull and monotonous appearance to countries where the olive is extensively cultivated, as Provence and Languedoc (Sharp, *Letters from Italy*).

O. europæa, var. *longifolia*, is the variety chiefly cultivated in the South of France and Italy. *O. europæa*, var. *latifolia*, is chiefly cultivated in Spain; its fruit is nearly twice the size of the common olive of Provence or Italy, but the oil is too rank for most English palates (Loudon, *Encycl. of Plants.*)

HAB.—Levant, Barbary, South of Europe. Notwithstanding that the olive is now so common in the southern parts of Europe, it is supposed by many to have been derived from Asia. Pliny tells us, on the authority of Fenestella, that there were no olive-trees in Italy, Spain, and Africa, in the reign of Tarquinius Priscus, in the 173rd year from the foundation of the city of Rome. The Phœnicians are said to have introduced the olive-tree into France 680 years before Christ. Near Terni, in the vale of the cascade of Marmora, is a plantation of very old trees, and supposed to be the same plants mentioned by Pliny, as growing there in the first century (Loudon, *Encycl. Garden.*)

DESCRIPTION.—The products of the olive-tree deserving of notice are the *resiniform exudation*, the *leaves*, and the *fruit*.

1. *Resiniform exudation of the olive-tree* (*Lecca gum*).—The older writers speak of an exudation from olive-trees, and which Dioscorides

(lib. i. cap. 141) describes as the *tears of the Æthiopic olive.* In modern times it has been improperly termed *olive gum.* Pelletier (*Ann. de Chim. Phy.* iii. 105 li. 196) has analysed it, and found that it consists of *a peculiar matter* (*olivile*), *brown resin* soluble in ether, and *benzoic acid. Olivile* consists of $C^6 H^{4\frac{1}{2}} O^2$.

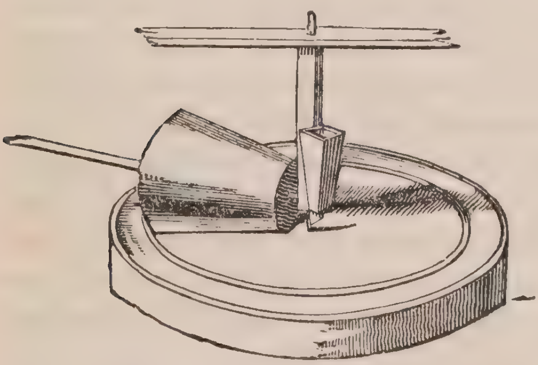
It was formerly employed in medicine.

2. *Olive leaves* (*folia olivæ*).—The leaves of the olive-tree have been analysed by Pallas (*Journ. de Pharm.* xiii. 604), who, among other products, found *tannic* and *gallic acids.* They have been employed externally as astringents and antiseptics; internally, as tonics in intermittents (Richard, *Elem. d'Hist. Nat.* t. ii. p. 21).

3. *Fruit of the Olive-trees; Olives* (*Olivæ*). The *preserved* or *pickled olives* (*Olivæ conditæ*), so admired as a dessert, are the green unripe fruit deprived of part of their bitterness by soaking them in water, and then preserved in an aromatised solution of salt. Several varieties are met with in commerce, but the most common is the *small French* (*O. europæa*, var. *longifolia*), and the *large Spanish olive* (*O. europæa*, var. *latifolia*). Olives *à la picholine* have been soaked in a solution of lime or alkali. *Ripe olives* are remarkable from the circumstance of their sarcocarp abounding in a bland, fixed oil.

Expression of Olive Oil.—The process for procuring olive oil is somewhat modified in different countries, though the principle is the same in all.

Fig. 187.



Spanish Olive-oil Mill.

In Spain, the olives are pressed by conical iron rollers, elevated above the stage or floor, round which they move on two little margins to prevent the kernel being injured, the oil from which is said to have an unpleasant flavour. Spanish olive oil, however, is inferior to other kinds, from the circumstance of the time which elapses between the gathering and the grinding of the olives. This arises from the number of mills not being in proportion to the quantity of fruit to be ground; so that the olives are placed in heaps to wait their turn, and in consequence often undergo decomposition (Dillon, *Travels through Spain*, p. 343, 1782; Jacob, *Travels in Spain*, p. 149, 1811).

In France, the finest oil is procured by bruising the fruit in the mill immediately they are gathered, and then submitting the paste to pressure. The first product has a greenish tint, and is termed *virgin oil* (*oleum olivarum virgineum; huile vierge*). The cake or *marc* is removed from the press, broken up with the hand, moistened with boiling water, and repressed. The products are water, and oil of a *second quality:* these separate by standing. The cake, which is left, is termed *grignon*, and is employed by some as fuel; others, however, ferment it, and, by the aid of boiling water, obtain a very inferior oil, called *gorgon*, which is employed either for soap-making or burning in lamps (Duhamel, *Traité des Arbres Fruit.* t. ii. p. 71-2).

With the view of increasing the quantity of oil, some persons allow the olives to undergo incipient fermentation, which breaks down the parenchyma of the fruit before they are pressed; but the quality of the oil is thereby injured. Guibourt (*Hist. des Drog.* t. ii. p. 339) tells us that it is a yellow, but a mild and agreeable oil, and is much used for the table.

The machinery employed by the Neapolitan peasants in the preparation of the Gallipoli oil is of the rudest kind. The olives are allowed to drop in their maturity from the tree on the ground, where they are picked up chiefly by women and children, and carried to the mill. The oil when expressed is sent, in sheep or goat skins carried on mules, to Gallipoli, where it is allowed to clarify in cisterns cut in the rock on which the town is built. From these it is conveyed in uteri or skins to basins near the sea-shore, and from these basins the oil casks are filled (M^cCulloch, *Dict. Commerce*).

According to Sieuve (Decandolle, *Phys. Vég.* p. 299), 100 lbs. of olives yield about 32 lbs. of oil; 21 of which come from the pericarp, 4 from the seed, and 7 from the woody matter of the nut (*pyrena*). That obtained from the pericarp is of the finest quality.

Recently-drawn olive oil deposits, by standing, a white fibrous matter, which the ancients employed in medicine, under the name of *amurca* (Pliny, *Hist. Nat.* lib. xv. cap. iii. ed. Valp.)

Properties of Olive Oil.—Olive oil (*oleum olivæ* seu *olivarum; sweet oil*) is an unctuous fluid, of a pale yellow or greenish yellow colour. When of good quality, it has scarcely any smell. Its taste is bland and mild. Its sp. gr. at 77° F. is 0·9109, according to Saussure. When exposed to a temperature of 32° F. it deposits white globules (*margarine*, Lecanu; *stearine*, Chevreul). It is soluble in about 1½ times its weight of ether; but it is very slightly soluble only in alcohol. By exposure to the air it readily becomes rancid; thin layers of it become thick, but do not dry. Hyponitrous acid converts it into *elaidine* (see p. 489), which, by saponification, yields *elaidic acid.* When mixed with sulphuric acid, and kept cool, it yields *sulpho-margaric*, *sulpho-glyceric*, and *sulpho-oleic acids.* With the basic metallic oxides it forms *glycerine* and *soaps* (*oleo-margarates*): *Spanish* or *Castile soap* (see p 333) is made with soda; *lead soap*, or *emplastrum plumbi* (see p. 520), with oxide of lead.

Varieties.—*Provence oil* (*oleum provinciale*), the produce of Aix, is the most esteemed. *Florence oil* is a very fine kind of olive oil, imported from Leghorn, in flasks surrounded by a kind of net-work formed by the leaves of a monocotyledonous plant, and packed in half chests; it is used at the table, under the name of *salad oil. Lucca oil* is imported in jars holding nineteen gallons each. *Genoa oil* is another fine kind. *Gallipoli oil* forms the largest portion of the olive oil brought to England; it is imported in casks. Apulia and Calabria are the provinces of Naples most celebrated for its production: the Apulian is the best. *Sicily oil* is of inferior quality; it is principally produced at Milazzo. *Spanish oil* is the worst. The foot deposited by olive oil is used for oiling machinery, under the name of *droppings of sweet oil.*

Adulteration of Olive Oil.—Olive oil is said to be occasionally mixed with other vegetable oils (as poppy oil). Four methods have been proposed to detect the fraud:—

1. *Beading.*—If we shake pure olive oil in a phial half filled with it, the surface of the oil soon becomes smooth by repose; whereas when poppy oil is present, a number of air-bubbles (or *beads* as they are termed) remain.

2. *Freezing.*—Olive oil is completely solidified when cooled by ice; poppy oil, however, remains in part liquid. Even two parts of olive oil to one of poppy oil will not completely congeal (Guibourt, *Hist. des Drog.* t. ii. p. 603).

3. *Electrical diagometer.*—Olive oil, according to Rousseau (*Journ. de Pharm.* t. ix. p. 587), conducts electricity 675 times worse than other vegetable oils. The addition of two drops of poppy or beech-nut oil to 154½ grains of olive oil is sufficient to quadruple the conducting power of the latter. To ascertain the conducting power of oil, Rousseau used the *electrical diagometer* (from διαγω, *to conduct*; and μετρεω, *to measure*). It consists of one of Zamboni's dry piles and a feebly-magnetized needle, moving freely on a pivot. The electricity developed by the pile produces a deviation in the direction of the needle; but when any substance is interposed between the needle and the pile, the deviation is less in proportion to the bad conducting power of the interposed substance.

4. *Formation of elaidine.*—If recently-made nitrate of mercury (prepared by dissolving 6 parts of mercury in 7·5 parts of nitric acid, sp. gr. 1·36) be mixed with twelve times its weight of pure olive oil, and the mixture strongly agitated, the whole mass becomes solid in the course of a few hours; this, however, does not occur with adulterated. We judge of the presence and quantity of foreign oils by the degree and quickness of solidification of the suspected olive oil (see p. 489).

Composition.—In 1808, Gay-Lussac and Thénard (*Rech. Phys. Chim.* ii. 320) examined the ultimate composition of this oil. In 1815, Braconnot (*Ann. de Chim.* xciii. 240) ascertained the proximate constituents of it; and subsequently Saussure (*Ann. de Chim. et Phys.* t. xiii. p. 349) examined the ultimate composition of these constituents.

Braconnot's Proximate Analysis.	
Elaine (Oleine)	72
Margarine	28
Olive Oil	100

Ultimate Analyses.			
	Gay-Lussac and Thénard's.	*Saussure's.*	
Carbon	77·213	76·034	82·170
Hydrogen	13·360	11·545	11·232
Oxygen	9·427	12·068	6·302
Nitrogen	0·000	0·353	0·296
	Olive Oil 100·000	Elaine 100·000	Margarine 100·000

1. *Elaine* or *Oleine.*—Braconnot obtained it by exposing olive oil to a temperature of about 21° F. in order to cause the congelation of the margarine. The elaine was a greenish yellow liquid; at 14° F. it deposited a little margarine.

2. *Margarine.*—The solid matter of olive and other vegetable oils obtained as above, is usually denominated *stearine*, but Lecanu (*Ann. de Chim. et Phys.* lv. 204) has pointed out several characters by which it is distinguished from that principle: thus, it is more fusible, and is much more soluble in cold ether. In most other respects it agrees with stearine.

Commerce.—The duty on olive oil is £4. 4s. per ton, except on that brought from Sicily, which is £8. 8s. In 1839, duty was paid on 12,374 tons.

Physiological Effects. (*a.*) *On vegetables.*—Olive oil, as well as other fixed oils, acts injuriously on the roots of plants, by obstructing their pores and meatus, and preventing the passage of water (Decandolle, *Phys. Vég.* p. 1347).

(*b.*) *On animals.*—Injected into the veins, the fixed oils prove injurious by their mechanical operation. They obstruct the circulation in the capillary vessels, and in this way cause death. Both Courten and Hertwich (Wibmer, *Wirk. d. Arzneim. u. Gifte.* Bd. iv. S. 9) have destroyed dogs by injecting half an ounce of olive oil into the veins.

(*c.*) *On man.*—The fixed oils are extremely nutritious, but they are difficult of digestion, and hence are apt to disagree with dyspeptics. Dr. Beaumont (*Exp. and Observ. on the Gastric Juice and the Phys. of Digest.*) has fully satisfied himself of the accuracy of this statement, by experiments on a man who had a fistulous opening in the stomach. He found that fatty substances required a longer time to undergo the process of chymification than other alimentary substances, and that bile was an important agent in facilitating their digestion. Some writers (as Dr. Dunglison, *Elem. of Hygiene*, p. 289) are of opinion that, taken as a condiment, with salad, oil promotes the digestibility of the latter. Swallowed in large doses, olive oil acts as a laxative, in general, without occasioning pain.

Uses.—In England the *dietetical* uses of olive oil are very limited, being principally confined to its mixture with salads. In Spain and some other countries it is frequently employed as a substitute for butter. Dyspeptics should carefully avoid its use.

Medicinally it is not often administered by the mouth. As a *mild laxative* it may be used in irritation, inflammation, or spasm of the alimentary canal, or of the urino-genital organs. In irritant poisoning it is exhibited as an *emollient* and *demulcent*, to involve acrid and corrosive substances, and sheath the stomach from their action. At one time it was supposed to possess antidotal properties for arsenical poisons; and Dr. Paris (*Pharmacol.* vol. i. p. 97, 6th edit.) tells us, that the antidote on which the men employed in the copper-smelting works and tin burning-houses in Cornwall, rely with confidence, "whenever they are infested with more than an ordinary portion of arsenical vapour, is sweet oil; and an annual sum is allowed by the proprietors, in order that it may be constantly supplied." There is, however, no reason to believe that its agency is more than mechanical, as already mentioned (see p. 396). Oil was formerly recommended as an antidote for cantharides, but the discovery of the solubility of cantharidin in oil has led to the suspicion that instead of alleviating it might increase the patient's danger. There is no just ground for supposing that oil, applied externally or taken internally, has any particular influence in counteracting the operation or relieving the effects of the poison of venomous serpents, notwithstanding the high encomiums that have been passed on it. In pulmonary or bronchial irritation, and spasmodic cough, olive oil is sometimes taken in the form of emulsion (made with gum, albumen, or alkali) with benefit; but in such cases, almond oil is generally preferred. As an *anthelmintic*, olive oil is occasionally used.

Olive oil is a frequent constituent of *laxative enemata*, especially in dysentery, or irritation of the bowels or of the neighbouring viscera.

Externally it is used in the form of *liniment* (as the *linimentum ammoniæ* and *linimentum ammoniæ sesquicarbonatis*; see p. 176). Smeared over the body, it has been recommended by Berchtold and others (*Hufeland's Journ.* Bd. vi. S. 437; and Bd. xii. St. iii. S. 153) as a safeguard against the plague. It may be employed also to relax the skin and sheath irritable surfaces. Frictions of olive oil have been employed in ascites and anasarca.

In *pharmacy*, olive oil is employed in the preparation of *liniments*, *ointments*, *cerates*, and *plasters*. In *surgery*, it is used for besmearing surgical instruments—as bougies, &c.

ADMINISTRATION.—The dose of olive oil as a laxative, is f℥j. to f℥ij.

Or'nus europæ'a, Persoon, L.—*European Flowering Ash.*

Fraxinus Ornus, *Linn.* D.

Sex. Syst. Diandria, Monogynia.

(Succus concretus, *L.*—Succus concretus *Manna*, *D.*—Sweet concrete exudation, probably from several species of Fraxinus and Ornus, *E.*)

HISTORY.—Actuarius is believed to be the earliest writer who mentions our manna (Friend, *Hist. of Physick*, i. 271). The nature of the substance called manna (*Manhu?* Hebr. *What is it?* Engl.) in our translation of the Old Testament (*Exod.* ch. xvi. v. 14), is quite unknown (Carpenter, *Script. Nat. Hist.* p. 514, 1829; *Pictorial Bible*). Under the names of *honey-dew*, *aërial-honey*, and *honey-oil* (δροσόμελι and ἀιρόμελι, Galen; ελαιόμελι, Dioscor.; *elæomeli*, Pliny), the ancients have been supposed to include our manna; for it is difficult to believe they were unacquainted with it, since Theophrastus (*Hist. Plant.* lib. iii. cap. xi.) speaks of two kinds of ash (Μελία, *Fraxinus*), one of which (ταπεινοτέρα, *humilior*) is supposed to be *Ornus europæa* (Sprengel, *Hist. Rei Herb.* i. p. 76).

BOTANY. *GEN. CHAR.*—*Calyx* very small, four-cleft. *Corolla* divided to the base into linear segments. *Pericarp* a winged samara, not dehiscing (Lindley).

SP. CHAR.—*Leaves* lanceolate, attenuated, stalked, serrated.

A small *tree*. *Leaves* opposite, large, pinnated in three or four pairs; *leaflets* ovato-oblong, pointed, irregularly toothed. *Panicles* large, and many-flowered. *Flowers* small and polygamous. *Corolla* yellowish or greenish-white. *Fruit* flat, wedge-shaped, smooth, winged.

HAB.—South of Europe; especially Calabria and Sicily.

Or'nus rotundifo'lia, considered by some as a variety of Ornus europæa, grows in Calabria, and also yields manna. Fée (*Cours d'Hist. Nat.* t. ii. p. 363) says that manna is probably also procured from *Fraxinus excelsior* and *parvifolia*.

EXUDATION OF MANNA.—In Calabria, manna is obtained by making incisions in the stem of Ornus europæa (Cirillo, *Phil. Trans.* vol. lx. p. 233). In Sicily, it is also procured in a similar manner (Houel, *Voy. Pittoresq. de Sicile*, &c. t. i. 52-3, 1782; Sestini, in Murray, *App. Med.* t. iii. p. 547). Houel, who has described and depicted the method of extracting it, as practised at Cinesi, near Palermo, says, the collection of manna commences about the 15th of August and terminates at the end of September, when the rainy season sets in. The incisions are made with a hooked knife, first in the lower part of the stem, and are repeated daily, extending them perpendicularly upwards. Each incision is about two inches long. A limpid water (some describe it as a thickish white juice) exudes, and gradually concretes to form manna. Beneath the lowest incision is placed a leaf of the Ornus, to convey the exuded liquor into a receptacle formed of a leaf of the Indian Fig (*Opuntia*). In this way is obtained *manna in sorts*. The fine *canulated manna* preferred by the English, is obtained during the height of the season, when the juice flows vigorously (Houel, *op. cit.*) Murray (apparently on the authority of Sestini) states, that Ornus rotundifolia and Fraxinus excelsior, as well as Ornus europæa, afford manna in Sicily; and Fothergill (*Phil. Trans.* vol. xliii. No. 472, p. 86) says, that while the Ornus yields it by artificial apertures, "it flows from the Fraxinus through every little cranny, and bursts through the large pores spontaneously." Manna has been supposed to be a natural product of the ash, but there are some difficulties in the way of this supposition. It is not produced in countries more northern than Calabria. Furthermore, the exudation of manna has been said not to occur naturally, but to be owing to a foreign action; either incision or the puncture of a little hemipterous insect (*Cicada Orni*) common on this tree (Decandolle, *Phys. Vég.* p. 238-9).

DESCRIPTION.—Several kinds of manna (*manna*) are described by pharmacologists. The finest of English commerce is called *flake manna* (*manna cannulata*). It is imported in deal boxes, having partitions, and frequently lined with tin-plate. It consists of pieces of from one to six inches long, one or two inches wide, and from half an inch to an inch thick. Their form is irregular, but more or less stalactitic; most of the pieces being flattened or slightly hollowed out on one side (where they adhered to the tree or substance on which they concreted), and on this side they are frequently soiled. Their colour is white, or yellowish-white; they are light, porous, and friable; the fractured surface presents a number of very small capillary crystals. The odour is somewhat like that of honey, and is to me rather unpleasant; the taste is sweet, but afterwards rather acrid. Under the name of *Sicilian Tolfa manna* I have received an inferior kind corresponding to the *manna in sorts* (*manna in sortis*) of some pharmacologists. From its name I presume it is brought from Sicily, and that it corresponds in quality to Tolfa manna produced near Civita-Vecchia, and which Fée (*Cours d'Hist. Nat.* ii. 366) says is but little valued. The Sicilian Tolfa manna occurs in small pieces, which seldom exceed an inch in length: some of these present the same appearances, with respect to consistence, colour, friability, and crystalline appearance, as the flake manna; others, however, are soft, viscid, brownish, and uncrystallized, like those of the next variety. The commonest kind of English commerce is called *Sicilian manna* (*manna siciliana*). It appears to me to be the *common* or *fatty manna* (*manna pinguis*) of some writers. It consists of small, soft, viscid fragments, of a dirty yellowish-brown colour, intermixed with some few dark-coloured small pieces of the flake variety. It contains many impurities intermixed.

COMMERCE.—Manna is imported into this country principally from Palermo and Messina. It is also occasionally brought from other ports of Sicily, viz. Licata, Girgenti, Catania, Terra Nova, and Marsala. Furthermore Naples, Leghorn, Trieste, Genoa, and Marseilles, are other places of shipment of it. In 1839, duty (3d. per lb.) was paid on 13,493 lbs.

COMPOSITION.—Manna was analyzed in 1809 by Bucholz (Gmelin, *Handb. d. Chem.* ii. 1295), who found it to consist of *mannite* 60·0, *uncrystallizable sugar* (capable of fermentation) *with colouring matter* (purgative bitter matter?) 5·5, *sweetish gum* 1·5, *gummy extractive* 0·8, *fibro-glutinous matter* 0·2, *water* and loss 32·0.

Mannite (*Manna Sugar*).—Is identical with *Grenadin*. It is extracted from manna by boiling alcohol: the mannite crystallizes by cooling the solution. Mannite is not peculiar to manna, being found in many vegetables. It is distinguished from common sugar by its incapability of undergoing the vinous fermentation (see p. 584). It is white, crystalline, odourless, has a sweet and agreeable taste, and is very soluble in water and in boiling alcohol, but is very much less so in cold alcohol. Heated strongly it is decomposed like ordinary sugar. It consists, according to the analysis of Liebig (*Pharm. Centr.-Bl. für* 1834, S. 589), of *Carbon* 39·8532, *Hydrogen* 7·7142, and *Oxygen* 52·548: these numbers correspond with the formula $C^6\ H^7\ O^6$. Mannite possesses the laxative properties of manna without the nauseous odour. The dose of it for children is ʒj. or ʒij.; for adults ℥ss. or ℥j.

Physiological Effects. (*a.*) *On animals generally.*—In moderate doses manna is nutritive, and is greedily devoured by some animals. Thus Swinburn (*Travels in the Two Sicilies*, 1785) tells us that vipers and martens are very fond of it. In large doses it acts as a mild laxative. The dose for carnivorous animals is about two ounces dissolved in broth or milk (Moiroud, *Pharm. Vét.*) It is rarely given to horses, on account of the large dose required.

(*b.*) *On man.*—It has an analogous operation on man—that is, in small doses it is nutritive, and in large ones mildly laxative. It acts on the bowels without exciting vascular irritation, and is, therefore, admissible in inflammatory cases. It is apt, however, to produce flatulence and griping. The fresher and less changed the manna, the feebler are said to be its laxative powers; and hence the Calabrians are enabled to use it frequently as an article of food. When by keeping and partial decomposition it has acquired an increase of laxative powers, it is less easily digested, and is more apt to excite flatulence. Hence also, we are told, the commoner kinds of manna are more laxative and more apt to disagree with the stomach than the finer varieties. The older writers imagined that manna promoted the secretion of bile. Manna approaches tamarinds as a laxative, but it is more nutritive and less refrigerant, in consequence of possessing more mucilaginous and saccharine matter, and less free vegetable acids.

Uses.—It is employed as a laxative, partly on account of the mildness of its operation, partly for its sweet flavour, in delicate persons, as females and children. Dr. Burns (*Principles of Midwif.*) recommends it for new-born infants, if the meconium do not come away freely. On account of its sweetness, it is frequently added to flavour purgative draughts, and is used as a common laxative for children, who readily eat it.

Administration.—It may be taken in substance or dissolved in warm milk or water. The dose for an adult is from ℥j. to ℥ij.; for children, from ʒj. to ʒiij.

Order 43. Styra'ceæ, *Richard*.—The Styrax Tribe.

Essential Character.—*Calyx* inferior or superior, with five divisions, persistent. *Corolla* monopetalous, the number of its divisions frequently different from that of the calyx; with imbricated æstivation. *Stamens* definite or indefinite, arising from the tube of the corolla, of unequal length, cohering in various ways, but generally in a slight degree only; *anthers* innate, two-celled, bursting inwardly. *Ovary* superior, or adhering to the calyx, with from three to five cells; *ovules* definite, the upper ascending, the lower pendulous, or *vice versâ*; *style* simple; *stigma* somewhat capitate. *Fruit* drupaceous, surmounted by or enclosed in the calyx, with from one to five cells. *Seeds* ascending or suspended, solitary, with the embryo lying in the midst of the *albumen; radicle* long, directed towards the hilum; *cotyledons* flat, foliaceous.—*Trees* or *shrubs. Leaves* alternate, without stipules; usually toothed, turning yellow in drying. *Flowers* axillary, either solitary or clustered, with scale-like *bracts.* The *hairs* often stellate (Lindley).

PROPERTIES.—Storax and benjamin, obtained from the genus *Styrax*, are balsamic. *Alstonia theiformis* is used at Santa-Fé, as tea. The properties of the other species are but little known.

Sty'rax officina'le, Linn. L. E. D.—*The Officinal Storax.*

Sex. Syst. Decandria Monogynia.

(Balsamum, *L.*—Balsamic exudation, *E.*—Resina, *D.*)

HISTORY.—Hippocrates (*De Nat. Mul.* p. 575 and 587, ed. Fæs.), Theophrastus (*Hist. Plant.* lib. ix. cap. 7), Dioscorides (lib. i. cap. lxxix.), and Pliny (*Hist. Nat.* lib. xii. cap. 40 and 55, ed. Valp.), speak of a substance which they term *Styrax* (στύραξ). Dioscorides says it is the produce of a tree like the quince (*Styrax officinale*, Sprengel, *Hist. Rei Herb.* i. 173), and that there are several varieties of it (all solid), and he mentions how it is adulterated. The best, he says, is unctuous, yellow, resinous, mixed with whitish lumps, and forms a honey-like liquid when melted: it comes, he adds, from Gabala [a Phœnician city], Pisidia, and Cilicia [countries of Asia Minor]. This is evidently the sort which more modern pharmacologists denominate *amygdaloid storax.* A worse variety, he says, is black, branny, friable, and covered with white mouldiness. This sort I presume to be very analogous to, if not identical with, the *common storax* of the shops, the "mouldiness" being the efflorescent benzoic acid: indeed the only character in which it differs is the colour; but as Pliny, who copies the description of Dioscorides, omits the word "*niger*," it is probable that the colour was inaccurately described. A third kind mentioned by Dioscorides is a transparent tear-like gum, and emulating myrrh; but it was very scarce. Probably this was the variety which in modern times has been termed *storax in the tear.* The substances employed to adulterate storax were ligneous dust (produced by eroding little worms), honey, the sediment of the iris, wax, fat, &c.

In modern times various substances have been met with in commerce under the name of *storax.* Some of these are certainly produced by the *Styrax officinale,* while others have been referred to a plant belonging to *Liquidambar* (see BALSAMACEÆ, p. 727).

BOTANY. *GEN. CHAR.*—*Calyx* rather campanulate, nearly entire or five-toothed. *Corolla* campanulate at the base, deeply three- to seven-cleft. *Stamens* six to sixteen, seldom ten, exserted; *filaments* united to the tube of the corolla, sometimes adhering at the base of the ring; *anthers* linear, two-celled, opening by internal longitudinal slits. *Style* simple. *Stigma* obtuse, somewhat lobed. *Drupe* dry, splitting imperfectly into two or three valves, with one, two, or three stones. *Seed* solitary, erect, with a large, leafy, thin *embryo*, lying in the midst of fleshy *albumen* with an inferior *radicle* (Lindley).

SP. CHAR.—*Leaves* ovate, beneath villous. *Racemes* simple, shorter than the leaf.

A small *tree. Stem* about twenty feet high; bark smooth. *Leaves* alternate, petioled, ovate, blunt-pointed, entire; smooth and shiny above, whitish and downy beneath. *Raceme* of from four to six flowers. *Calyx* almost hemispherical, with five to seven short marginal teeth. *Corolla* white, externally hoary, with five, six, or seven segments. *Fruit* (*capsule*, Nees) coriaceous, downy, usually with one seed.

Storax bark is supposed to constitute the *cortex thymiamatis* of some pharmacologists. It is probably the Νάσκαφθον of Dioscorides (lib. i. cap. 22). It is in thin, light, red, highly odorous fragments or shavings, frequently covered with an efflorescence of benzoic acid. I am indebted for a sample of it to Professor Guibourt.

Hab.—The Levant, Palestine, Syria, Greece. Cultivated in the southern parts of Europe.

Exudation.—If incisions be made into the stem of this tree, a resinous juice exudes, which, when somewhat hardened, constitutes one or more of the balsamic substances denominated in the shops *storax*. Some writers state that the exudation arises from the puncture of the stem by a little insect. Though this balsam exudes from the storax-tree in the south of France (Duhamel, *Traité des Arbr.* t. ii. p. 288), yet that of commerce is the product of Asiatic Turkey (Murray, *App. Med.* t. ii. p. 80).

Description.—The substances termed *storax* (*storax* seu *styrax*) are very numerous. With the exception of the first kind, the following varieties I have met with:—

1. *Storax in the tear* (*Styrax in granis*).—Yellowish-white or reddish-yellow tears, about the size of peas. *White storax* (*styrax albus*) is formed of tears agglutinated so as to form masses somewhat resembling pale galbanum. Both sorts, however, are exceedingly rare, and are unknown to our drug-dealers. I have never met with a single specimen of either in English commerce. White storax is also scarce in Paris; for Professor Guibourt, to whom I wrote for a sample, says that there was one fine specimen at a druggist's in Paris, but it was not for sale. "I discovered it (says he) with great pleasure, having established the distinction of that variety only from a scrap of one or two drachms."

2. *Amygdaloid Storax* (*Styrax amygdaloides*).—It occurs in compact masses, having a very agreeable odour, analogous to that of vanilla, and a yellowish or reddish-brown colour. They are interspersed with white tears (giving the mass an amygdaloid appearance). This variety is very scarce. I have a fine sample, weighing nearly two ounces and a quarter: it cost me, in Paris, 24 francs per ounce. There is (or was a few years since) a magnificent piece, in the possession of a French pharmacien, who offered to sell it for 500 francs. Amygdaloid and white storax were formerly imported enveloped in a monocotyledonous leaf, under the name of *cane* or *reed storax* (*storax calamita verus*). A fine specimen (about the size and shape of half an orange) is in Dr. Burgess's collection, belonging to the Royal College of Physicians of London.

3. *Reddish-brown Storax* (*Storax rouge-brun*, Guibourt).—This differs from the preceding in the absence of the white tears, and in the presence of saw-dust. It is reddish-brown, and has a similar, but less powerful, odour to that of the amygdaloid kind. It is not found in the London drug-houses.

4. *Black Storax.*—Under the name of *Storax noir*, I have received from Professor Guibourt a very dark reddish-brown mass, which easily softens, and has the odour of vanilla. "It appears to be formed of a

balsam, which has been melted and inspissated by heat with saw-dust. Its very characteristic odour leads me to consider it," says M. Guibourt (*Letter to the author*), " as different from storax calamita, storax liquida, and liquidambar." It is not found in the London drug-houses.

5. *Liquid Storax* (*Styrax liquidus*).—This is the produce of a species of *Liquidambar*, and has been before described (see BALSAMACEÆ, p. 727).

6. *Scobs styracina.*—Under this name I include several substances sold as storax, but which are evidently fine saw-dust impregnated with a sufficiency of some resinous liquid (in some cases, perhaps, *styrax liquida*) to give them cohesiveness.

α. *Common Storax* (*Styrax vulgaris* seu *Styrax calamita*, offic.)—This is imported in large round cakes, of a brown or reddish-brown colour and fragrant odour. It is brittle and friable, being very easily rubbed into a coarse kind of powder; yet it is soft and unctuous. When exposed to the air it becomes covered with an efflorescence of benzoic acid (which, to the superficial observer, looks like a whitish kind of mouldiness), and falls to powder. It appears to consist of some liquid resin mixed with fine saw-dust or bran. Boiled with rectified spirit, it yields a reddish solution, which becomes milky on the addition of water. The insoluble residue is a reddish saw-dust (of storax wood?). It seems probable, says Lewis (*Chem. Works of C. Neumann*, by W. Lewis, p. 290, 1759), " that the common storax is the juice received immediately in vessels, and mixed with saw-dust enough to thicken it; the shops requiring, under the name of storax, a solid or consistent mass, and evaporation being found to dissipate its fragrance. At least I cannot conceive for what other purpose the woody matter could be added; for it is too easily distinguishable to have been intended as an imposition."

β. *Solid or Cake Storax* (*Styrax solide* ou *Styrax en pain*, Guibourt.)—Under this name I have received, from Professor Guibourt, a substance very analogous to the preceding; but the saw-dust obtained by digesting it in spirit is not so intensely red.

γ. *Drop or gum Storax.*—Under this name I have once met, in English commerce, a storax which was highly valued. It was a circular cake, about a foot in diameter, and four or five inches thick. It was blackish, with a greenish tint; had a pilular consistence, considerable tenacity, and a very agreeable odour. By keeping it became covered with an efflorescence of benzoic acid. Boiled in rectified spirit it gave an inky appearance to the liquid, and left a blackish saw-dust.

δ. *Hard, blackish Storax.*—Under the name of *brown Storax*, I purchased in Paris a solid, heavy, compact, hard, blackish substance, having the odour of liquid storax. Boiled in rectified spirit it yielded an almost colourless liquid and a brownish saw-dust. Is this the *Storax brun noiratre* which Guibourt (*Hist. de Drog.* ii. p. 595) says is made at Marseilles?

COMMERCE.—I find, on the examination of the books of a wholesale druggist, that all the storax (solid and liquid) imported into this country during seven years, came from Trieste.

COMPOSITION.—Neumann (*Chem. Works*, by Lewis, p. 290) submitted *common storax* (*styrax calamita*, offic.) to a chemical examination. More recently Reinsch (*Pharm. Central.-Blatt für* 1838, S. 537 and 810) analyzed three kinds of *styrax calamita*. In 1830, Bonastre (*Journ. de*

Pharm. t. xvi. p. 88) analyzed a *storax from Bogota.* The same chemist (*Ibid.* t. xvii. p. 338) examined a fluid, which he termed *liquid storax*, but which was *liquidambar* (see p. 727).

Reinsch's Analyses.

	1. *Storax calamita.* Opt. 1785. Nestler.	2. *Brown granular.*	3. *Reddish compact.*
Volatile oil	?	0·5	0·4
Resin	41·6	53·7	32·7
Subresin	?	0·6	0·5
Benzoic acid	2·4	1·1	2·6
Gum and extractive	14·0	9·3	7·9
Matter extracted by potash	15·0	9·6	23·9
Woody fibre	22·0	20·2	27·0
Ammonia	traces	stronger traces	strongest traces
Water	5·0	5·0	5·0
Storax calamita	100·0	100 0	100·0

1. *Volatile Oil of Storax.*—Obtained by digesting the distilled water of storax with ether. The *solid* oil was white, crystalline, and fusible; its odour was agreeable; its taste aromatic and warm. The *fluid* oil had not so penetrating an odour.

2. *Resin of Storax.*—Is soluble in alcohol, but insoluble in water.

3. *Benzoic acid.*—See *Benzoin.*

Guibourt (*Hist. des Drog.* ii. 595) says that both *white* and *amygdaloid storax*, when treated by boiling alcohol, leaves (independently of impurities) a small quantity of an insoluble *white substance;* and the filtered liquid becomes turbid on cooling.

Physiological Effects.—Storax produces the before-described (p. 74) effects of the balsamic substances. Its stimulant properties are more particularly directed to the mucous surfaces, especially to the bronchial membrane. Hence it is called a stimulating expectorant. In its operation it is closely allied to balsam of Peru and benzoin, but is less powerful than the latter.

Uses.—Internally storax has been principally employed in affections of the organs of respiration. In chronic bronchial affections, admitting of the use of stimulants, it may be used as an expectorant. It has also been employed in chronic catarrhal affections of the urino-genital membrane. Applied to foul ulcers in the form of ointment, it sometimes operates as a detergent, and improves the quality of the secreted matter.

Administration.—Purified storax may be exhibited, in the form of pills, in doses of from grs. x. to ℈j.

1. Styrax colatus, L.—*Extractum Styracis*, E. (Dissolve storax in rectified spirit, and strain; then let the spirit distil with a gentle heat, until it becomes of a proper consistence, *L.*—The directions of the *Edinburgh College* are essentially the same, except that they direct the evaporation to be carried on by the vapour-bath, until the product have the consistence of a thin extract). This process is intended for the purification of *styrax vulgaris* (*styrax calamita*, offic.); but Mr. Brande says it is inefficient. Strained storax is used in the following preparation, and also in *tinctura benzoïni composita.*

2. Pilulæ Styracis compositæ, L.; *Pilulæ Styracis, E.* (Strained Storax [Extract of Storax, *E.*; Storax Resin, *D.*] ℥iij. [℥ij. *E.*];

[Hard, *L.*] Opium [powdered, *L.*], ʒj.; Saffron, ʒj. Beat them together until incorporated [and divide the mass into 60 pills, *E.*] These pills are useful in chronic coughs, and some other pulmonary affections. They are valuable also in another point of view: they sometimes enable us to exhibit opium to persons prejudiced against its use; the saffron and storax concealing the smell and flavour of this narcotic, while the name of the pill cannot discover the harmless deception. The dose is from grs. v. to grs. x.

Sty'rax Ben'zoin, Dryander, L. E. D.—*The Benjamin Tree.*

Benzoin officinale, *Hayne.*

Sex. Syst. Decandria, Monogynia.

(Balsamum, *L.*—Concrete balsamic exudation, *E.*—Resina, *D.*)

History.—As the ancients were acquainted with so many oriental vegetable products, we should have expected, *à priori*, that benzoin would have been known to them. But this does not appear to have been the case; at least we are unable to identify it with any of the substances described by the old writers (see Garcias, *Arom. Hist.* in Clusius, *Exot.* p. 155).

Botany. *Gen. Char.*—Vide *Styrax officinale.*

Sp. Char.—*Leaves* oblong, acuminate, tomentose beneath. *Racemes* axillary, compound, nearly the length of the leaves.

Tree. Stem thickness of a man's body. *Leaves* oval-oblong, entire. *Calyx* campanulate, very obscurely five-toothed. *Corolla* grey, of five petals, perhaps connate at the base. *Stamens* ten. *Ovary* superior, ovate; *style* filiform; *stigma* simple. (Condensed from Dryander, *Phil. Trans.* vol. lxxvii. p. 308).

Hab.—Sumatra, Borneo, Siam, Java.

Extraction of the Balsam.—Benzoin is obtained in Sumatra as follows:—When the tree is six years old, longitudinal or somewhat oblique incisions are made in the bark of the stem, at the origin of the principal lower branches. A liquid exudes, which by exposure to the sun and air soon concretes, and the solid mass is then separated by means of a knife or chisel. Each tree yields about three pounds of benzoin annually, for the space of ten or twelve years. That which exudes during the first three years is white, or yellowish white, and is denominated *head benzoin.* The benzoin which subsequently flows is of a brownish colour, and is termed *belly benzoin.* After the tree is cut down the stem is split, and some benzoin scraped from the wood; but its colour is dark, and its quality bad, owing to the intermixture of parings of wood and other impurities: this sort is called *foot benzoin.* The relative values of head, belly, and foot benzoin, are as 105, 45, 18. Benzoin is brought down from the country in large cakes (called by the natives *tampangs*) covered with mats. In order to pack it in chests, these cakes are softened by heat: the finer by exposure to the sun; the coarser by means of boiling water (Marsden, *Hist. of Sumatra*, p. 154, 3d ed.; Crawford, *Hist. of the Ind. Archipel*, vol i. p. 518, and vol. iii. p. 418).

Description.—Benzoin (*benzoinum; asa-dulcis*) is met with in commerce of various qualities: these are sometimes distinguished by the terms *firsts*, *seconds*, and *thirds*. Frequently the finer kinds are called *Siam benzoin*, while the commoner kind is termed *Calcutta benzoin.*

1. *Siam Benzoin*, offic. *Benzoin of first quality*.—There are two kinds of Siam benzoin of commerce; the one in tears, the other in masses.

α. *Benzoin in tears* (*Benzoinum in lachrymis*).—This kind seems to be identical with the *true benzoin in tears*, which Savary (Alston, *Lect. on the Mat. Med.* vol. ii. p. 403) says was brought in considerable quantity to Paris, by the attendants of the Siamese ambassadors. It consists of irregular flattened pieces, some of which are angular, and the largest of them barely exceeding an inch in length. Externally these pieces are shiny, or dusty from their mutual friction, and are of an amber or reddish-yellow colour; they are brittle, and may be easily rubbed to powder. Internally they are translucent or milky, and frequently striped; they have a pleasant odour, but little or no taste.

β. *Lump Benzoin* (*Benzoinum in masses*).—The finest kind consists of agglutinated tears (*white lump benzoin*). More commonly we find the tears are connected together by a brown, resiniform mass, which, when broken, presents an amygdaloid appearance, from the white tears imbedded in the mass (*amygdaloid benzoin; benzoinum amygdaloides*).

γ. *Translucent Benzoin*.—From my friend, Dr. Royle, I have received a sample of Siam benzoin whose properties are somewhat different to the preceding. The small masses consist of agglomerated tears, which, instead of being white, are translucent, or, in a few instances, almost transparent.

Crawford (*Journ. of an Embassy to Siam and Cochin-China*, p. 407, 1828) says that the benzoin of Siam is procured from Lao. He also says that a substance resembling, and hitherto confounded with, benzoin, produced in Lao, Raheng, Chiang-mai, and La-Kon, is abundantly found in Siam. The tree producing it cannot be, he thinks, the *Styrax Benzoin*, as it grows as far north as the twentieth degree of latitude.

2. *Calcutta Benzoin*, offic. *Benzoin of second and third quality*.—This is imported in chests from Calcutta. It occurs in large rectangular blocks, marked with the impression of a mat, and covered with white cotton cloth. When broken, we observe but few large white tearsin it. The mass is principally made up of a brown resiniform matter, with numerous, white, small pieces or chips intermixed, which thereby give the broken surface a speckled appearance, somewhat like that of a fine-grained granite. This kind corresponds to the *common* or *brown benzoin* (*benzoinum commune* seu *in sortis*) of some writers.

Commerce.—Benzoin is usually imported into England from Sincapore or Calcutta. Not unfrequently it is brought direct from Siam; occasionally from Sumatra, Penang, Bombay, Madras, Batavia, &c. The greater part of it is exported. In 1839, duty (4s. per cwt.) was paid on 108 cwts. only.

Composition.—In 1811, Bucholz (quoted by Schwartze, *Pharm. Tabell.* S. 269) published an analysis ofbenzoin. In 1816, John (*Ibid.*) made known a second; and in 1823, a third was published by Stoltze (*Berl. Jahrb.* xxv. i. 55). Moreover, Mr. Brande (*Nicholson's Journ.* x. 82) and Unverdorben (*Poggendorf's Annal.* xvii. 179) have examined this substance.

	Bucholz.	John.	Stoltze. White.	Stoltze. Amygdaloid.	Stoltze. Brown.
Volatile oil (aroma, *John*)	......	......	traces.	traces.	traces.
Benzoic acid	12·5	12·0	19·80	19·42	19·70
Resin { yellow, soluble in ether	83·3	84·5	79·83	27·10	8·80
Resin { brown, insoluble in do.			0·25	50·53	69·73
Matter like balsam of Peru	1·7	0	0	0	0
Aromatic extractive	0·5	0·50	0	0·25	0·15
Woody matter and other impurities	2 0	2·00	0	2·60	1·45
Water and loss	....	0·25	0·12	0·10	0·17
Salts (benzoates and phosphates)	....	0·75	......	......	......
Benzoin.....................	100·0	100·00	100·00	100·00	100·00

1. *Volatile Oil of Benzoin.*—Distilled with water, benzoin does not yield any essential oil; but when exposed to heat without water, benzoic acid and an empyreumatic oil are volatilized. This oil may be deprived of its empyreuma by redistillation with water, and then smells agreeably of benzoin. An oil of benzoin obtained by distillation, without water, is used at Sumatra as a perfume (Marsden, *Sumatra*, p. 184).

2. *Resin of Benzoin.*—It is soluble in all proportions in alcohol. On the addition of water to the tincture, a milky liquid (absurdly called *virgin's milk*) is formed, owing to the precipitation of the resin in the form of a white powder, which may be obtained quite free from benzoic acid, and then constitutes the *magisterium benzoes* of some old writers. The acids (acetic, hydrochloric, and sulphuric) also precipitate the alcoholic solution. Sulphuric acid strikes a fine red colour with resin of benzoin. Benzoin resin colours the chloride of iron green, but does not cause any precipitate. This property would lead to the suspicion of the presence of either gallic or tannic acid, but neither has been detected. Stoltze makes two kinds of resin in benzoin: one of a *yellow* colour, and soluble in ether; the other *brown*, and insoluble in this liquid. Unverdorben, however, makes three varieties: one (*resina alpha*) is insoluble in carbonate of potash, but soluble in ether; a second (*resina beta*) is insoluble in both carbonate of potash and ether; and the third (*resina gamma*) is feebly electro-negative, soluble in carbonate of potash (forming a resinate of potash), and very slightly soluble in ether.

3. *Benzoic Acid; Flowers of Benjamin* (*Acidum Benzoicum*).—This acid was described in 1608 by Blaise de Vigenere; but it seems to have been known to Alexander Pedemontanus in 1560. It exists ready formed in certain vegetable substances (as the balsams), and is readily produced in some others by the action of exterior agents (as heat, air, acids, and alkalies). It is readily obtained from, and was formerly supposed to exist in, certain animal substances (as the urine of herbivorous animals), which are now known not to contain it, but yield it only by the decomposition of some of their proximate principles. The benzoic acid procured from the urine of horses is not contained in that liquid, but is produced by the decomposition of hippuric acid.

As met with in the shops it occurs in the form of light feathery white crystals, having a sour, warm taste, but no odour. It readily fuses and volatilizes, its vapour being exceedingly irritating to the air-passages. It is combustible, burning with a bright yellow flame. It is very sparingly soluble in cold water, dissolves in about twenty-five parts of water, and is very soluble in alcohol.

Benzoic acid is readily distinguished from other acids by its light and feathery crystals, its fusibility, volatility, odour of its vapour, and by the characters of its soluble salts. Thus the benzoate of ammonia produces, with the sesquisalts of iron, a pale red precipitate (*benzoate of iron*), and with the nitrate of silver, acetate of lead, nitrate of mercury, and supernitrate of bismuth, white precipitates (*benzoates* of the respective metals).

The composition of benzoic acid is as follows:—

Ultimate constituents.

	Eq.	Eq. Wt.
Carbon	14	84
Hydrogen	5	5
Oxygen	3	24
Anhydrous Benzoic Acid	1	113
Water	1	9
Crystallized Benzoic Acid	1	122

Hypothetical composition.

	Eq.	Eq. Wt.
Benzule	1	105
Oxygen	1	8
Anhydrous Benzoic Acid	1	113
Water	1	9
Crystallized Benzoic Acid	1	122

Benzule or *Benzoyle* is a yellow crystallizable substance, supposed to be the base of benzoic acid: it consists of C^{14} H^5 O^2. *Oil of bitter almonds*, deprived of hydrocyanic acid, is a *hydret of benzule*, its composition being C^{14} H^6 O^2. A crystalline substance, formed in oil of bitter almonds, and called *benzoin*, *camphoride*, or *camphor of oil of bitter almonds*, has the same composition. By heating benzoate of lime, the acid loses the elements of carbonic acid, and forms a thick oil called *benzone*, composed of C^{13} H^5 O. Heated with slacked lime, benzoic acid yields a liquid bicarburet of hydrogen, called *benzine*. With nitrogen and hydrogen, benzule forms *benzamide*, composed of C^{14} H^7 N O^2.

Physiological Effects.—Benzoin produces the general effects of the balsams before mentioned (p. 74). Its power of producing local irritation renders it apt to disorder the stomach, especially in very susceptible individuals. Its constitutional effects are those of a heating and stimulating substance, whose influence is principally directed to the mucous surfaces, especially of the air-tube. It is more acrid and stimulant, and less tonic, than myrrh, to which some pharmacologists have compared it. It has appeared in some instances to act as a stimulant to the sexual organs.

Uses.—An an internal remedy the employment of benzoin is almost wholly confined to chronic pulmonary affections, especially those of the bronchial membrane. Its stimulant properties render it improper in all acute inflammatory complaints, and its acridity prevents its employment where there is much gastric irritation. Its use, therefore, is better adapted for torpid constitutions. Trousseau and Pidoux (*Traité de Thérap.* ii. 477) speak most favourably of the effects of the balsams in chronic laryngitis, as I have before (pp. 74-5) noticed. The mode of employing benzoin in balsamic fumigations in this disease, has been before noticed (see p. 74).

Administration.—Benzoin is scarcely ever administered alone. The dose of it in *powder* is from grs. x. to ℨss. On account of the agreeable odour evolved when benzoin is heated, this balsam is frequently employed for *fumigations*, as in the ceremonies of the Roman Catholic church. The *species ad suffiendum, Ph. Bor.*, consists of benzoin and amber, of each lb. ss., and lavender flowers, ℥ij.—*Fumigating pastiles* also contain benzoin: the following is an excellent formula for them:—Benzoin, in powder, sixteen parts; balsam of tolu; sandal-wood, in powder, of each four parts; true labdanum, one part; a light [linden] charcoal, forty-eight parts; nitrate of potash, two parts; tragacanth, one part; gum Arabic, two parts; cinnamon water, twelve parts. F. S. A. a soft and ductile mass, which is to be formed into cones with a flat, tripod base. Dry at first in the air, afterwards by a stove (Henry and Guibourt, *Pharm. Raison.* t. i. p. 402).

1. Tinctura Benzoini composita L. E. D. *Balsamum Traumaticum;*

Wound Balsam; Balsam for Cuts; Friar's Balsam; Jesuit's Drops; *The Commander's Balsam.* (Benzoin, ℥iijss. [in coarse powder, ℥vj. *E.*]; [Storax, strained, ℥ijss. *L.*]; Balsam of Tolu, ʒx. [Peru-balsam, ℥iv. *E.*]; Aloes, ʒv. [East Indian Aloes, ℥j. *E.*]; Rectified Spirit, Oij. [Oiij. and f℥iij. *E.*] Macerate for fourteen [seven, *E. D.*] days, [pour off the clear liquor, *E.*] and strain. The ingredients used by the *Dublin College* are the same as, and the proportions nearly identical with, those of the London College.) A stimulating expectorant: administered in chronic catarrhs: dose, f℥ss. to f℥ij. It is decomposed by water. A very pleasant mode of exhibiting it is in the form of emulsion, prepared with mucilage and sugar, or yelk of egg. Tinctura Benzöini composita is occasionally applied to foul and indolent ulcers, to excite the vascular action, and to improve the quality of the secreted matter. It is a frequent application to recent incised wounds. If applied to the cut surfaces it causes temporary pain, and cannot promote adhesion (or union by the first intention), though by exciting too much inflammation it may sometimes prevent it. But when the edges of the wound have been brought together, the tincture may be carefully applied to the lint or adhesive plaster as a varnish and cement. Here it acts mechanically, excluding air, and keeping the parts in their proper position. In the same way, it may sometimes prove serviceable in contused wounds. *Court* or *Black Sticking Plaster* (*Emplastrum adhæsivum Anglicum*, Ph. Bor.) is prepared by brushing first a solution of isinglass, and afterwards a spirituous solution of benzoin, over black sarcenet.

2. *Acidum Benzoicum*, L. E. D. (Benzoin, lb. j. Put the benzoin in a proper vessel placed on sand, and the heat being gradually raised, sublime until nothing more rises; press that which is sublimed, wrapped in bibulous paper, and separate it from the oily part; afterwards again sublime it. *L.*—The directions of the *Edinburgh College* agree with these, except that they order "any convenient quantity" of benzoin to be used, and "a glass-mattrass" to be employed in the manufacture.—The process of the *Dublin College* is as follows: Benzoin, five parts; Lime, fresh burnt; Muriatic Acid, of each, one part; Water, two hundred parts. Triturate the Benzoin with the Lime, then boil the mixture in one hundred parts of Water; suffer the vessel to rest, and pour off the liquor when cold. Boil the remainder in seventy parts of water, and again pour off the cold liquor. Evaporate the mixed liquors to one-half, filter them through paper, and to the liquors, when cold, gradually add the Muriatic Acid. Lastly, having decanted off the supernatant fluid, dry with a gentle heat the residual powder, previously washed with a small quantity of cold water; pass it into a proper vessel, and with a slow fire sublime the benzoic acid).

The process of the *London* and *Edinburgh Colleges* is the simplest and, I believe, the most economical. The following is the method practised on a large scale:—"The better kind of benzoin is most economically employed: it may be put into an iron pot, set in brickwork over a proper fire-place; the sublimate is most conveniently received into a large wooden box, lined with paper, communicating by a conical iron or tin-plate neck with the subliming pot. The first product may be sublimed a second time in the same apparatus; and by conducting the process rather rapidly, the acid condenses in beautiful prismatic crystals, somewhat elastic. If slowly sublimed, it is more powdery. By this process of sublimation, good benzoin yields 10 to 12 *per cent.* of acid contaminated by empyreumatic oil, and which, when pressed between folds of blotting-paper, and again sublimed, is reduced to the proportion of 8 or 9 per cent. of the purified acid" (Brande, *Manual of Chemistry*, p. 975, 4th ed.) The simplest method of procuring it is by putting coarsely-powdered benzoin into an earthen pot, over which is placed a cone of brown paper, and applying a moderate heat: the acid sublimes into the cone, and there condenses. Some employ, as a substitute for the cone, *a house*, as it is termed, made of pasteboard and laths, and lined with loose sheets of blotting-paper, which are renewed every time of use. The oil produced in sublimation is, for the most part, formed during the process.

Scheele's process, adopted by the *Dublin College*, is, I believe, seldom followed. By boiling benzoin and lime with water, a soluble *benzoate of lime* is formed. Muriatic acid is then added to the concentrated solution, by which *benzoic acid* is precipitated, while *chloride of calcium* (in solution) and *water* are formed. The precipitated benzoic acid is then sublimed. The acid obtained by this process is said to be whiter and purer (being free of empyreumatic oil) than that procured by sublimation only. Carbonate of soda is sometimes substituted for lime in the above process, by which a soluble benzoate of soda is obtained.

Good benzoic acid has the following properties:—It is colourless, and is sublimed entirely by heat (*Edinb. Pharm.*) When cautiously heated it totally evaporates with a peculiar odour. It is sparingly soluble in water, but plentifully in rectified spirit. It is entirely dissolved by solution of potash or lime-water, and is precipitated by hydrochloric acid (*Pharm. Lond.*) The other properties of the acid have been already described (see p. 937).

The local action of benzoic acid on the body is that of an irritant: thus when swallowed it causes a sensation of acridity in the back part of the mouth and throat, and of heat in the stomach. Its vapour, when inhaled, is exceedingly irritating, and causes violent coughing. Its remote effects are those of a stimulant, whose influence is principally directed to the mucous surfaces, especially the bronchial membrane.

Alone it is rarely employed in medicine. Formerly it was given mixed with gum or sugar, in doses of from grs. v. to ℈j. in chronic pulmonary affections. Its principal use now is as a constituent of the *tinctura camphoræ composita* (see p. 797).

Order 44. Pyrola'ceæ, *Lindley*.—The Winter Green Tribe.

Essential Character.—*Calyx* free, four-, more frequently five-partite, persistent. *Petals* five, free or cohering, perigynous? with an imbricated æstivation. *Stamens* twice the number of the petals, to which they are not adherent; *anthers* bilocular, dehiscing by two pores. *Ovarium* three- to five-celled, seated on a hypogynous disk. *Style* one. *Stigma* roundish or lobed, sometimes slightly indusiate. *Capsule* three- to five-celled, three- to five-valved, loculicidal-dehiscent. *Placentæ* adherent at the centre. *Seeds* indefinite, minute, with a pellicle indusiate or winged. *Embryo* minute, at the base of fleshy albumen, with moderately distinct cotyledons.—*Herbs*, natives of the northern hemisphere, perennial or scarcely *under-shrubs*, smooth. *Stems* round, naked or leafy. *Leaves* simple, entire or dentate. *Flowers* racemose, somewhat umbellated, rarely solitary, white or rose-coloured (D.C. *Prodr.* vii. 772).

Properties.—See *Chimaphila umbellata*.

Chimaph'ila umbella'ta, Nuttall, E.—*Pipsissewa; Umbellated Winter Green.*

Chimiphila corymbosa, *Pursh, L.*—Pyrola umbellata, *Linn. D.*

Sex. Syst. Decandria, Monogynia.

(Folia, *L.*—Herb, *E.*—Herba, *D.*)

History.—The Pipsissiwa was first employed medicinally by the aborigines of America. It was introduced to the notice of the profession, in 1803, by Dr. Mitchell (*Inaug. Diss.* Philad. 1803).

Botany. *Gen. Char.*—*Calyx* five-cleft. *Petals* five, spreading, deciduous. *Stamens* ten; two in front of each petal; *filaments* dilated in the middle. *Ovarium* rounded-obconical, obtusely angular, umbilicated at the apex. *Style* very short, concealed in the umbilicus of the ovary. *Stigma* orbicular, tuberculated, five-crenate. Cells of the *capsule* dehiscent at the apex; the valves not connected by tomentum (D. C. *Prod.* vii. 775).

Sp. Char.—*Filaments* smooth. *Bracts* linear-awl-shaped. *Leaves* cuneate-lanceolate, of the same colour (D. C.)

A perennial *under-shrub. Rhizome* woody, creeping. *Stems* ascending, somewhat angular, marked with the scars of former leaves. *Leaves* in irregular whorls, evergreen, coriaceous, on short petioles, serrate, smooth, shining. *Flowers* nodding in a small corymb. *Corolla* white, tinged with red, having an agreeable odour.

Hab.—Woods of Europe, Asia, and more frequently North America.

Description.—The officinal parts are the leaves (*folia chimaphilæ* seu *pyrolæ*), or the leaves and the stems (*herba chimaphilæ* seu *pyrolæ*). The fresh leaves exhale a peculiar odour when bruised: their taste is bitter and astringent. The infusion of the dried herb is rendered green (*tannate of iron*) by sesquichloride of iron.

Composition.—The dried plant was analyzed, in 1817, by Elias Wolf (*Diss. de Pyrola umb.* Goett. quoted by Geiger, *Handb. d. Pharm.* ii. 215). It consisted of *bitter extractive* 18·0, *resin* 2·4, *tannin* 1·38, *woody fibre*, with a small portion of *gum* and *vegetable calcareous salts*, 78·22.

The active principle has not been isolated. It probably resides in the substance called *bitter extractive.* The *resin* and *tannin*, however, must contribute to the medicinal effect.

Physiological Effects.—The fresh leaves appear to possess considerable acridity, depending, probably, on some volatile constituent; for Dr. Barton says, that when bruised they produce rubefaction, vesication, and desquamation, if applied to the skin.

The infusion of the dried leaves, when swallowed, acts as a tonic, producing an agreeable sensation in the stomach, and assisting the appetite and digestive process. It promotes the action of the secreting organs, more especially the kidneys, over which, indeed, it has appeared to exercise a specific influence, increasing the quantity of urine, diminishing, as some have imagined, the quantity of lithic acid or lithates secreted, and beneficially influencing several forms of chronic nephritic disease. Indeed, this plant possesses, in its medicinal as well as in its natural historical and chemical relations, qualities analogous to those belonging to Uva-ursi.

Uses.—The following are the principal diseases in which it has been employed:—

1. *In Dropsies*, accompanied with great debility and loss of appetite, it is useful as a diuretic, as well as on account of its stomachic and tonic qualities. It was introduced to the notice of practitioners in this country, as a remedy for this class of diseases, by Dr. W. Somerville (*Med.-Chir. Trans.* v. 340). Dr. Beatty (*Trans. of the King and Queen's Coll. of Phys., Ireland*, vol. iv. p. 23) has also found it useful in this disease.

2. *In Chronic Affections of the Urinary Organs.*—Pyrola has been found serviceable in the various disorders of the urinary organs, in which the Uva-ursi frequently proves beneficial; such as cystirrhœa and calculous complaints. It has also occasionally alleviated some cases of hæmaturia, ischuria, dysury, and gonorrhœa.

3. *In Scrofula.*—We can readily believe that, as a tonic, this remedy may be useful in various forms of scrofula. But it has been supposed by some to possess almost specific powers; and in America its reputation is so high, that in the provinces it acquired the title of "*King's Cure.*" Dr. Paris (*Pharmacol.*) says, that "an irregular practitioner, who has persuaded a certain number of persons in this metropolis that he possesses remedies, obtained from the American Indians, by which he is enabled to *cure* scrofula in its worst forms," relies for success on chimaphila. In some ill-conditioned scrofulous ulcers, pyrola is used in the form of a wash.

Administration.—Chimaphila is given in the form of *decoction* or *extract:* the latter has been employed in doses of ten or fifteen grains.

Decoctum Chimaphilæ, L. *Decoctum Pyrolæ*, *D.* (Chimaphila, ℥j.; [Distilled *L.*] Water, Oiss. [Oij. wine-measure, *D*]. Boil down to a pint, and strain, *L.* The *Dublin College* macerates it for six hours in water, then bruises, and afterwards returns it to the water: the liquor is to be evaporated to a pint).—Dose, f℥j. to f℥ij.

Order 45. Erica'ceæ, *Lindley.*—The Heath Tribe.

Ericæ, *Juss.*—Ericeæ, *R. Brown.*

Essential Character.—*Calyx* four- or five-partite, almost equal, entirely unadherent to the ovary, persistent. *Corolla* perigynous or somewhat hypogynous, gamopetalous, four- or five-partite, or with four or five distinct petals, regular or more rarely irregular petals imbricated by æstivation. *Stamens* definite, equal or double in number to the petals, entirely or almost free from the corolla. *Anthers* two-celled; cells hard, dry, separate either at the apex or base, often furnished with some appendage, dehiscing by a terminal pore. *Ovary* free, surrounded at the base by a disc, which is sometimes nectariferous. *Style* single, rigid. *Stigma* undivided, toothed, or three-lobed. *Fruit* capsular, many-seeded, many-celled; dehiscence varies. *Seeds* inserted in a central placenta, small, indefinite; the *testa* firmly adhering to the nucleus. *Embryo* round, in the axis of fleshy albumen; the radicle opposite to the hilum. *Shrubs* or *under-shrubs*, rarely small *trees*. *Leaves* alternate, rarely somewhat opposite or verticillate, without stipules, usually rigid, entire, evergreen, articulated on the stem (D. C. *Prodr.* vii. 580).

Properties.—The plants of this order are astringent and diuretic. One or both of these properties they owe to the presence of tannic acid.

Arctostaph'ylos Uva-ur'si, Sprengel, L. E.—*The Bear-berry.*

Ar'butus Uva-ursi, *Linn. D.*

Sex. Syst. Decandria, Monogynia.

(Folia, *L. D.*—Leaves, *E.*)

History.—Some doubt exists whether this plant was known to the ıncient Greeks and Romans. Bauhin (*Pinax*, p. 470) and some others, think it is the ἰδαία ῥίζα of Dioscorides (lib. iv. cap. 44); but the leaves are very unlike those of *Ruscus aculeatus* (ὀξυμυρσίνη), to which he, as well as Pliny (*Hist. Nat.* lib. xxvii. cap. 69, ed. Valp.), compares them. The ἄρκτου σταφυλὴ of Galen agrees better with the uva-ursi, though the short description given of it applies also to Ribes rubrum (Murray, *De Uva Ursi: Opuscula*, 19-20).

Botany. *Gen. Char.*—*Calyx* five-partite. *Corolla* ovate-urceolate; the mouth five-toothed, revolute, short. *Stamens* ten, inclosed; *filaments* somewhat dilated at the base, hairy-ciliate; *anthers* compressed, with two pores at the point, laterally two-awned, awns reflexed. *Ovarium* globose-depressed, surrounded with three scales; *style* short; *stigma* obtuse. *Berry* (or berried drupe) globose, five-, rarely six-, seven-, or ten-celled; cells one-seeded (D. C.)

Sp. Char.—Procumbent. *Leaves* coriaceous, persistent, obovate, quite entire, shining. *Flowers* disposed in terminal small racemes. *Bractlets* beneath the pedicles, obtuse, small (D. C.).

Stems woody, round, and trailing. *Leaves* alternate, stalked, evergreen; convex and wrinkled above; concave and paler beneath. *Bractlets* coloured. *Sepals* pale-reddish, permanent. *Corolla* rose-coloured, smooth. *Berry* globose, scarlet, mealy within, very austere and astringent. *Seeds* seldom more than four or five, though there are the rudiments of eight or ten.

Hab.—Indigenous. Northern parts of Europe, Asia, and America. On dry, stony, and alpine heaths.

Description.—The dried leaves (*folia uvæ ursi*) are of a dark, shining, green colour, and have a bitter astringent taste, but no odour. Their under surface is reticulated. The leaves of *Vaccinium Vitis Idæa* (*Red Whortleberry*) are said to be occasionally substituted for those of Uva-ursi: the fraud (which is unlikely to occur in this country) may be detected by the edges of the leaves being minutely toothed, and the under surface dotted; whereas the edges are entire, and the under surface reticulated, in the genuine leaves. Furthermore, the false leaves are deficient in astringency; and their watery infusion is coloured green by sesquichloride of iron, but does not form any precipitate with gelatin; whereas the true ones are highly astringent, and their watery infusion forms a blackish-blue precipitate with the sesquichloride of iron (see Braconnot, *Bull. de Pharm.* iii. 348; and Bouillon-Lagrange, *Ann. de Chim.* lv. 46).

Composition.—Uva-ursi leaves were analyzed, in 1809, by MM. Melandri and Moretti (*Bull. de Pharm.* i. 59), and in 1827 by Meissner (Gmelin, *Handb. d. Chem.* ii. 1294). The constituents in 100 parts are, according to the last-named chemist, *gallic acid* 1·2, *tannin with some gallic acid* 36·4, *resin* 4·4, *oxidized extractive, with some citrate* (?) *of* *lime* 0·8, *gum with supermalates of lime and soda, and traces of tannin and common salt*, 3·3, *chlorophylle* 6·3, *gum* (*pectic acid?*) *extracted by potash* 15·7, *extractive obtained by potash* 17·6, *lignin* 9·6, *and water* 6·0 (excess 1·3).

Tannic acid is the active principle of the leaves. An aqueous infusion produces a bluish-black precipitate (*tannate of iron*) with the ferruginous salts, and a yellowish-white one (*tannate of gelatin*) with a solution of isinglass. *Gallic acid* also contributes to the astringency of the leaves.

PHYSIOLOGICAL EFFECTS. (*a.*) *On animals generally.*—Most animals refuse to eat this plant; there are, however, some few exceptions to this statement. Birds, it is said, will eat the berries; and Murray (*Opuscula*, p. 98) tells us that two kinds of insects feed on the plant, one of which (a species of Coccus) yields a crimson dye. Girardi (Wibmer, *Wirk. d. Arzneim.* i. 209) found that an infusion of the leaves might be injected into the urinary bladder of animals with impunity; but when taken internally it excited vomiting, and contraction, and inflammation of the stomach.

(*b.*) *On man.*—The most obvious effects of Uva-ursi are those of the vegetable astringents before described (see pp. 79-80). But the remarkable benefit frequently obtained by the use of it in affections of the urinary organs—a benefit not equally procurable by the use of other vegetable astringents—leads to the belief that it has some particular influence over these organs; though the only effect observable in healthy persons is an alteration of the colour of the urine (shewing that the colouring matter of the plant is absorbed), and a slight increase in the quantity of this secretion. Alexander (*Exp. Essays*, p. 151) found that ℥ss. of the powder acted as a mild diuretic (see p. 94). In large doses, the powder readily nauseates. As the astringent principle of Uva-ursi has been detected in the urine, it is not improbable that part of the beneficial effects which this plant produces in affections of the kidneys and of the mucous membrane lining the urinary organs, may be owing to the local action of the tannin, in its passage through and from the kidneys.

USES.—As an astringent it is applicable to all the purposes for which the vegetable astringents generally are used (see p. 80). It has been employed as an antidote in poisoning by ipecacuanha (see *Ipecacuanha*). But the principal use of this remedy is in *chronic affections of the bladder*, attended with increased secretion of mucus, and unaccompanied with any marks of active inflammation. Thus, in the latter stages of catarrhus vesicæ, the continued use of Uva-ursi is frequently most beneficial. Combined with hyoscyamus, says Dr. Prout (*On Affect. of the Urin. Org.* pp. 185 and 268, 2nd ed. 1825), and persevered in steadily *for a considerable time*, it seldom fails to diminish the irritation and quantity of mucus, and thus to mitigate the sufferings of the patients. "It undoubtedly possesses," he adds, "considerable powers in chronic affections of the bladder, *for which only it is adapted*, its operation being slow, and requiring perseverance." Sir Benjamin Brodie (*Lond. Med. Gaz.* vol. i. p. 300) on the other hand, observes, that "Uva-ursi has the reputation of being useful in some cases of chronic disease of the bladder, and in this [inflammation] among the rest. I must say, however, that I have been disappointed in the use of Uva-ursi, and that I have not seen those advantages produced by it which the general reputation of the medicine had led me to expect. I have seen much more good done by a very old medicine"—the root of the Cissampelos Pareira. Such are the opposite statements on the effects of this remedy, made by two of the most eminent writers on diseases of the urinary organs. My own experience of it amounts to this: that in some cases the relief obtained by the use of it was most marked; whereas, in other instances, it was of no avail. It is to be remembered, that its astringent operation unfits it for acute cases, and that the alteration which it produces in the condition of the urinary organs is effected very slowly; so that to be beneficial, it requires to be exhibited for a considerable period. *In calculous affections* it has occasionally given relief. De Haen (*Rat. Med.* t. ii. p. 63) and Van Swieten (*Commentaries*, t. xvi. p. 300) speak of the good effects of it in these cases. It alleviated the pain, checked the purulent and mucous secretion, and restored the urine to its natural condition. These effects seem to have arisen from its influence over the kidneys and bladder, for it did not appear to affect the calculus. *In chronic bronchial affections*, with profuse mucous or purulent secretion, it may occasionally prove serviceable. Dr. Bourne (*Cases of Pulmonary Consump.* &c. *treated with Uva-ursi*, 1805) gave it in powder (in doses of from 8 to 20 grs.) three times daily, in milk, with success.

Administration.—The dose of the *powder* is from ℈j. to ʒj. But the "powdered leaves of this plant are so bulky and disagreeable, that few stomachs will bear to persevere long enough in the use of the requisite quantity; and the same is pretty much the case with the *infusion* and *decoction*" (Prout, *op. cit.* p. 185). On this account the *extract* is frequently preferred.

1. *Decoctum Uvæ ursi*, L. (Uva-ursi, bruised, ℥j.; Distilled Water, Oiss. Boil down to a pint, and strain).—Dose, f℥j. to f℥iij., three times a day.

2. *Extractum Uvæ ursi*, L. (Uva-ursi bruised, lb. ijss.; Boiling Distilled Water, *Cong.* ij. Macerate for twenty-four hours; then boil down to a gallon, and strain the liquor while hot; lastly, evaporate to a proper consistence).—Dose, grs. v. to grs. xv., twice or thrice daily.

Order 46. Lobelia'ceæ, *Jussieu.*—The Lobelia Tribe.

Essential Character.—*Calyx* five-lobed, more or less adherent to the ovary. *Corolla* persistent, more or less gamopetalous; *lobes* or petals five, usually irregular, sometimes almost regular; *tubes* entire or cleft longitudinally. *Æstivation* somewhat valvular. *Stamens* five, alternate with the lobes of the corolla, usually free, but sometimes adherent to the tube of the corolla; *filaments* free, or more or less connate; *anthers* cohering, bilocular, dehiscing longitudinally; *pollen* ovoid. *Ovary* inferior or semi-superior, two- or rarely one-celled, then with parietal placentæ; *style* one; *stigma* surrounded with a ring of hairs. *Fruit* usually dehiscing at the apex by two valves, rarely from above by an operculum or laterally by three valves, or indehiscent. *Seeds* indefinite; *albumen* fleshy; *embryo* straight.—Lactescent *herbs* or *under-shrubs*, rarely small *trees*. *Leaves* alternate, without stipules. *Flowers* usually axillary, solitary, racemose. (Condensed from D. C.)

Properties.—Dangerous or suspicious plants; mostly acrids or acro-narcotics.

Lobe'lia infla'ta, Linn. L. E.—*Bladder-podded Lobelia; Indian Tobacco.*

Sex. Syst. Pentandria, Monogynia.

(Herb, *E.*)

History.—This plant was employed by the aborigines in America; and after having been for some time used by quacks, was introduced to the notice of the profession by the Rev. Dr. Cutler, of Massachusetts (Thacker's *Amer. New Disps.* p. 258, 2nd ed.) It was introduced into England in 1829, by Dr. Reece (*Pract. Treat. on the Anti-asthmatic Properties of Bladder-podded Lobelia*, 1829).

Botany. *Gen. Char.*—*Caylx* five-lobed; the tube obconical, ovoid or hemispherical. *Corolla* cleft longitudinally from above, bilabiate; the *tube* cylindrical or funnel-shaped, straight; the *upper lip* usually smaller, and erect; the *lower* generally spreading, broader, three-cleft, or more rarely three-toothed. The two inferior, or occasionally all, of the *anthers* barbed at the point. *Ovary* inferior or semi-superior, and (in species very much alike) somewhat free (D. C.)

Sp. Char.—*Stem* erect, the lower part simple and shaggy; the upper part ramose and smooth. *Leaves* irregularly serrate-dentate, hairy; the lower ones oblong, obtuse, shortly petioled; the middle ones ovate-acute, sessile. *Flowers* small, racemose. *Pedicels* short, with an acuminate bract. *Calyx* smooth, the *tube* ovoid; the lobes linear-acuminate, equal to the corolla. *Capsule* ovoid, inflated (D. C.)

Annual; height, a foot or more. *Root* fibrous. *Stem* angular. *Leaves* scattered; segments of the *calyx* linear, pointed. *Corolla* delicate blue. *Anthers* collected into an oblong, curved body, purple; *filaments* white. *Style* filiform; *stigma* curved, and inclosed by the anthers. *Capsule* two-celled, ten-angled, crowned with the calyx. *Seeds* numerous, small, brown.

Hab.—North America, from Canada to Carolina, and the Mississippi. Begins to flower in July. The plant should be collected in August or September.

Description.—The herb (*herba lobeliæ inflatæ*) is usually imported into this country, prepared by the Shaking Quakers of New Lebanon, North America. It has been compressed into oblong cakes, weighing either half a pound or a pound each, and enveloped in blue paper. The dried herb is pale greenish-yellow; its smell is somewhat nauseous and irritating; its taste burning and acrid, very similar to that of tobacco. Its powder is greenish.

Composition.—No accurate analysis of lobelia has hitherto been made. Dr. Colhoun (*Journ. of the Philadelphia Coll. of Pharm.* p. 300, January 1834) has announced the existence of a peculiar principle in this plant. From a few experiments which I have recently made on lobelia, I find that it contains *a volatile acrid principle* (*oil?*) *an acid* (peculiar?), *resin, chlorophylle, gum, extractive, woody fibre,* and perhaps *caoutchouc.*

1. *Volatile Acrid principle* (*Volatile Oil of Lobelia? Lobelianin?*).—Water distilled from lobelia has the peculiar smell and the nauseous acrid taste of the plant. In one experiment I obtained a thin film of what appeared to be a solid volatile oil. The distilled water of lobelia is unaffected by acids, sesquichloride of iron, and tincture of nutgalls.

2. *Lobelina* (?). — The substance described by Colhoun is said to resemble the *nicotin* of Berzelius. It is soft, brown, and deliquescent; and has the acrid tast

of lobelia. It is soluble in alcohol, scarcely so in ether: with acids it forms salts (Colhoun). By evaporating the tincture of lobelia, and digesting the residue in dilute hydrochloric acid, I have obtained a yellowish-brown extract, (*impure hydrochlorate of lobelina?*) soluble in alcohol, insoluble or nearly so in ether, and having an acrid taste, like that of lobelia, but stronger. Tincture of nutgalls added to the aqueous decoction of lobelia causes a slight cloudiness (*tannate of lobelina?*)

3. *An acid* (*Lobelic? acid*).—A decoction of lobelia reddens litmus, and becomes, on the addition of sesquichloride of iron, dark olive-brown; and in a short time a precipitate is formed (*lobeliate? of iron*). A solution of isinglass produced no obvious change in the decoction, showing the absence of tannic acid. Sulphate of copper gave rise to a green precipitate (*lobeliate? of copper*). Nitrate of silver caused a slight precipitate (*lobeliate? of silver*) soluble in nitric acid. The effect produced by the salts of iron on decoction of lobelia is analogous to that caused by the same agents on aloes (see p. 645) and cebadilla (p. 635).

4. *Resin.*—By gently evaporating the tincture of lobelia (prepared with proof spirit) a resinous substance separates and floats on the surface of the liquid. It has an exceedingly acrid taste.

Chemical Characteristics.—A strong decoction of lobelia dropped into rectified spirit deposits a precipitate (*gum*). Acetate, and especially diacetate of lead, form yellow precipitates with the decoction. Protonitrate of mercury also forms a copious precipitate. (For other chemical characteristics, see above).

Physiological Effects.—An accurate account of the effects of this plant on man and animals is yet wanting. But from the observations hitherto made its operation appears to be very similar to that of tobacco (see p. 871); and from this circumstance, indeed, it has been called the *Indian Tobacco.* I have before remarked, that both in its taste and in the sensation of acridity which it excites in the throat, it resembles common tobacco. This analogy between nicotiana and lobelia, originally noticed by the American practitioners, is confirmed by Dr. Elliotson (*Lancet*, April 15, 1837, p. 144).

(*a.*) *On animals generally.*—Horses and cattle have been supposed to be killed by eating it accidentally (Thacher, *American New Dispens.* p. 259, 2nd ed.) An extraordinary flow of saliva is said to be produced by it on cattle (*Lancet*, May 13, 1837, p. 299).

(*b.*) *On man.*—α. *In small doses* it operates as a *diaphoretic* and *expectorant.* Mr. Andrews (*Lond. Med. Gaz.* vol. iii. p. 260), who speaks from its effects on himself, says, it has "the peculiar soothing quality of exciting expectoration without the pain of coughing."

β. *In full medicinal doses* (as ℈j. of the powder) it acts as a powerful, nauseating *emetic.* Hence it has been called the *emetic weed.* It causes severe and speedy vomiting, attended with continued and distressing nausea, sometimes purging, copious sweating, and great general relaxation. These symptoms are usually preceded by giddiness, headache, and general tremors. The Rev. Dr. M. Cutler (Thacher, *op. cit.*), in his account of its effects on himself, says, that taken during a severe paroxysm of asthma, it caused sickness and vomiting, and a kind of prickly sensation through the whole system, even to the extremities of the fingers and toes. The urinary passage was perceptibly affected, by producing a smarting sensation in passing urine, which was probably provoked by stimulus upon the bladder. It sometimes, as in the Rev. Dr. Cutler's case, gives almost instantaneous relief in an attack of spasmodic asthma. Intermittent pulse was produced by it in a case mentioned by Dr.

Elliotson. Administered by the rectum, it produces the same distressing sickness of stomach, profuse perspiration, and universal relaxation, which result from a similar use of tobacco.

γ. *In excessive doses, or in full doses too frequently repeated*, its effects are those of a powerful *acro-narcotic poison.* "The melancholy consequences resulting from the use of Lobelia inflata," says Dr. Thacher (*op. cit.*), "as lately administered by the adventurous hands of a noted empiric, have justly excited considerable interest, and furnished alarming examples of its deleterious properties and fatal effects. The dose in which he is said usually to prescribe it, and frequently with impunity, is a common tea-spoonful of the powdered seeds or leaves, and often repeated. If the medicine does not puke or evacuate powerfully, it frequently destroys the patient, and sometimes in five or six hours." Its effects, according to Dr. Wood (*United States Dispens.*) are, "extreme prostration, great anxiety and distress, and ultimately death, preceded by convulsions." He also tells us that fatal results (in America) have been experienced from its empirical use. These are the more apt to occur when the poison, as is sometimes the case, is not rejected by vomiting.

Uses.—Lobelia is probably applicable to all the purposes for which tobacco has been used (see pp. 872-4). From my own observation of its effects, its principal value is as an antispasmodic.

1. *In asthma* (especially the *spasmodic* kind) *and other disorders of the organs of respiration.*—Given in full doses, so as to excite nausea and vomiting, at the commencement of, or shortly before, an attack of *spasmodic asthma*, it sometimes succeeds in cutting short the paroxysm, or in greatly mitigating its violence; at other times, however, it completely fails. Occasionally it has proved serviceable in a few attacks, and, by repetition, has lost its influence over the disease.

To obtain its beneficial influence in asthma, it is not necessary, however, to give it in doses sufficient to excite vomiting. Dr. Elliotson (*Lancet*, April 15, 1837, p. 144) recommends the use of small doses at the commencement, and says that these should be gradually increased, if neither headache nor vomiting occur; but immediately these symptoms come on, the use of the remedy is to be omitted. Given in this way, I can testify to its good effects in spasmodic ashma. It has also been used in *croup*, *hooping-cough*, and *catarrhal asthma*, but with no very encouraging effects.

2. *In strangulated hernia*, Dr. Eberle (*Treat. of the Mat. Med.* vol. i. p. 48, 2d ed.) employed it effectually, instead of tobacco, in the form of enema.

3. *As an emetic*, it has been employed by Dr. Eberle (*op. cit.*) in croup; but its operation is too distressing and dangerous for ordinary use.

Administration.—It may be given in *powder*, *infusion*, or *tincture* (alcoholic or ethereal). Dr. Reece employed an *oxymel.* The dose of the *powder*, as an emetic, is from grs x. to ℈j.; as an expectorant, from gr. j. to grs. v. It deserves especial notice that the effects of lobelia are very unequal on different persons, and that some are exceedingly susceptible of its influence (Elliotson, *Lancet*, June 1832; and April 15, 1837).

1. Tinctura Lobeliæ, E.—(Lobelia, dried and in moderately fine powder, ℥iv.; Proof Spirit, Oiss. This tincture is best prepared by the

process of percolation, as directed for the tincture of capsicum [p. 879]; but it may also be made in the usual way by digestion).—Dose, as an emetic and antispasmodic, from f℥j. to f℥ij. repeated every two or three hours until vomiting occur; as an expectorant, ♏x. to f℥j. For children of one or two years old, the dose is ♏v. to ♏xx.

2. *Tinctura Lobeliæ Ætherea*, E.—(Lobelia, dried and in moderately fine powder, ℥iv.; Spirit of Sulphuric Ether, Oiss. This tincture is best prepared by percolation, as directed for tincture of capsicum [p. 879]; but it may be also obtained by digestion in a well-closed vessel for seven days). This may be used in the same doses as the alcoholic tincture.

With some persons the ether is apt to disagree, and in such the alcoholic tincture will be preferred. *Whitlaw's etherial tincture*, used by Dr. Elliotson, consisted of Lobelia, ℔j.; rectified spirit, Oiv.; spirit of nitric ether, Oiv.; spirit of sulphuric ether, ℥iv. Macerate for fourteen days, in a dark place (*Lancet*, June 3, 1837).

Antidote (see *Tobacco*, p. 875).

Other Medicinal Lobeliaceæ.

Lobe'lia Siphiliti'ca, a native of the United States, possesses emetic, cathartic, and diuretic properties. It derived its name siphilitica from its supposed efficacy in syphilis, as experienced by the North American Indians, who considered it a specific in that disease, and from whom the secret of its use was purchased by Sir W. Johnson (Woodville, *Med. Bot.* vol. i. p. 178). Its antisyphilitic powers appear to have no foundation in fact (Pearson, *Observ. on Various Art. of the Mat. Med.* p. 70). The root was the part used; it was given in the form of decoction.

Order 47. Compos'itæ, *Decandolle.*

Synanthereæ, *Richard*; Mutisiaceæ, Cichoraceæ, Asteraceæ, and Cynaraceæ, *Lindley.*

Essential Character.—*Calyx* gamosepalous; the tube adherent to the ovary; the *limb* generally degenerated into a pappus, or sometimes into a scaly corona, or entirely abortive. *Pappus* simple, pilose, ramose, or plumose; stipitate by the prolongation of the tube beyond the ovary or sessile. *Corolla* inserted into the upper part of the tube of the calyx, gamopetalous; the nerves in the tube being directed towards the sinuses; in appearance five, but really ten; which then proceed from the sinuses, along the margins of the lobes, to the apex, where they inosculate [*neuramphipetalous*]. *Tube* various in length; in the regular corolla, often funnel-shaped. *Lobes* generally five, valvate in æstivation. *Corolla* regular or irregular; the regular, of five equal lobes (*tubular corolla*); the irregular, either two-lipped (*bilabiate corolla*) or strap-shaped, five-dentate (*ligulate corolla*). *Stamens* generally five; in the female florets wanting, or rudimentary. *Filaments* adnate to the tube of the corolla; distinct or monadelphous; articulated near the apex, the upper portion acting as a connective. *Anthers* erect; concreted in the tube, which is perforated by the style (*syngenesious* or *synantherous*). *Pollen* rough or smooth, globose or elliptical. *Ovary* adherent to the calyx, one-seeded. *Style* generally terete and bifid at the apex; the branches (commonly called *stigmas*) more or less free; flat above, convex beneath. *Stigmatic glands* (*true stigmas*) ranged in a double row along the upper margin of the branches of the style, more or less prominent; the upper portion of the style, in hermaphrodite flowers, provided with hairs, which collect the pollen. *Fruit* consisting of an achene and calyx closely connected, and enclosing the embryo; the *achene* one-celled, articulated on the receptacle, generally sessile; rostrate or not rostrate at the apex. *Seed* attached to the base of the fruit by a very short funiculus. Inner portion of the *spermoderm* (*endopleura* of D. C., *albumen* of Lessing) diaphanous, pierced by the bifid funiculus. *Embryo* erect, with a short, straight, inferior radicle, and an inconspicuous plumule. *Florets* collected into dense heads (*capitules*); either all hermaphrodite (*homogamous*) or the outer ones female or neuter, the inner being hermaphrodite or male (*heterogamous*); or the capitules are entirely composed of florets of distinct sexes (*monœcious*, *diœcious*, *heterocephalous*). *Capitules* with the florets sometimes all tubular (*discoid* or *flosculous*); sometimes all ligulate (*ligulate* or *semi-flosculous*): sometimes the central florets are tubular, while those of the ray are ligulate (*radiate*). *Involucre* of one or many rows of more or less united scales, surrounding the receptacle which is formed by the concretion of the extremities of the peduncles; either covered with chaffy scales (*paleaceous*) or naked (*epaleaceous*): sometimes the receptacle is indented with pentagonal hollows (*areolated*), or the margins of these are slightly raised (*alveolated*) or fringed (*fimbriated*).—*Herbs* or *shrubs* (rarely *trees*), forming almost a tenth part of the vegetable kingdom. *Leaves* simple, alternate, or opposite (Macreight, condensed from Decandolle).

Properties.—Variable. A bitter principle pervades most species; this communicates tonic properties. The laxative and anthelmintic qualities possessed by some of the species may, perhaps, depend on the same principle. Volatile oil is frequently present: it communicates aromatic, carminative, diaphoretic, and, in some cases, acrid properties. Bitter matter and volatile oil are often associated in the same plant. A few of the Compositæ are narcotic.

Tribe I.—*Eupatoriaceæ.*

Tussila'go Far'fara, Linn. L. D.—*Coltsfoot.*

Sex. Syst. Syngenesia, Polygamia superflua.

(Folia et Flores, *D.*)

History.—This is the *βήχιον* of Hippocrates (*Opera*, p. 523 and 829, ed. Fæs.) and Dioscorides (lib. iii. cap. 126). By the Greeks and Romans it was smoked, to relieve obstinate cough (see p. 865).

Botany. *Gen. Char.*—*Head* many-flowered, heterogamous; *florets* of the ray females, in many rows, very narrowly ligulate; of the disc males, few in number, tubular, with a campanulate five-toothed limb. *Receptacle* naked. *Involucral scales* in about one row, oblong, obtuse. *Anthers* scarcely tailed. *Styles* of the disc inclosed, abortive; of the ray bifid, with taper arms. *Achene* of the ray oblong-cylindrical, smooth; of the disc abortive. *Pappus* of the ray in many rows; of the disc in one row, consisting of very fine setæ (D. C.)

Sp. Char.—The only species.

Rhizome creeping horizontally. *Leaves* cordate, angular, toothed, downy beneath. *Scape* clothed with imbricated scaly bracts, usually one-flowered. *Heads* appearing before the leaves. *Flowers* yellow.

Hab.—Indigenous. Various parts of Europe and Asia. Flowers in March and April.

Description.—The herb and flowers (*herba et flores farfaræ* seu *tussilaginis*) have a bitterish mucilaginous taste. The dried leaves are odourless, but the flowers retain a slight odour. The watery infusion becomes green (*tannate of iron*) on the addition of sesquichloride of iron.

Composition.—No analysis of the plant has yet been made. *Mucilage*, *bitter extractive*, *tannic acid*, *colouring matter*, *salts*, and *woody fibre*, are the principal constituents.

Physiological Effects.—The effects are not very obvious: they may be regarded as emollient, demulcent, and very slightly tonic.

Uses.—Employed as a popular remedy in pulmonary complaints (chronic coughs especially).

Administration.—The *decoction* (prepared by boiling ℥j., or ℥ij. of the plant in Oij. of water to Oj.) may be taken in doses of f℥ij. or f℥iij., or ad libitum.

Tribe II.—*Asteroideæ.*

In'ula Helen'ium, Linn. L. D.—*Elecampane.*

Sex. Syst. Syngenesia, Polygamia superflua.

(Radix, *L. D.*)

History.—This is the ἑλένιον of Hippocrates (*Nat. Mul.* p. 572, ed. Fæs.) and of Dioscorides (lib. i. cap. 27).

Botany. *Gen. Char.*—*Head* many-flowered, heterogamous; *florets* of the ray females, in one row, sometimes by abortion sterile, usually ligulate, rarely somewhat tubular and trifid; those of the disc hermaphrodite, tubular, five-toothed. *Involucre* imbricated in several rows. *Receptacle* flat or somewhat convex, naked. *Anthers* with two setæ at the base. *Achene* without a beak, tapering, or in I. *Helenium*, four-cornered. *Pappus* uniform, in one row, composed of capillary, roughish setæ (D. C.)

Sp. Char.—*Stem* erect. *Leaves* dentate, velvety-tomentose beneath, acute; the radical ones ovate, greatly attenuated into petioles; those of the stem semi-amplexicaul. *Peduncles* few, one-headed, corymbose at the apex (D. C.)

Root perennial, thick, branching. *Stem* three to five feet high. *Leaves* large, serrated, veiny. *Heads* terminal. *Flowers* bright-yellow.

Hab.—Indigenous. Various parts of Europe. Flowers in July and August.

Description.—The dried root (*radix helenii* seu *enulæ*) of the shops consists of longitudinal or transverse slices, which are yellowish-gray, and have an aromatic camphoraceous smell, and a warm bitter taste. Iodine colours the root brown. Sesquichloride of iron produces, in the infusion, a green colour (*tannate of iron*).

Composition.—The root has been analyzed by John (Gmelin, *Handb. d. Chem.* ii. 1288), by Funcke (*Trommsdorf's Journ.* xviii. I. p. 74), and by Schulz (*Berl. Jahrb. d. Pharm.* 1818, p. 251). The constituents, according to John, are—*volatile oil* a trace, *elecampane-camphor* 0·3 to 0·4, *wax* 0·6, *acrid soft resin* 1·7, *bitter extractive* 36·7, *gum* 4·5, *inulin* 36·7, *woody fibre* 5·5, *oxidized extractive with coagulated albumen* 13·9; besides *salts of potash, lime, and magnesia.*

1. *Elecampane-camphor.* (*Helenin*, Thomson).—Colourless crystals, heavier than water, fusible, volatile, very soluble in ether, oil of turpentine, and boiling alcohol. Nitric acid converts it into resin.

2. *Resin.*—Brown, fusible in boiling water, and soluble both in alcohol and ether. When warm it has an aromatic odour. Its taste is bitter, nauseous, and acrid.

3. *Inulin.* (*Alantin* and *Menyanthin*, Trommsdorf; *Elecampin*, Henry; *Dahlin* and *Datiscin*, Payen).—An amylaceous substance, organized, according to Raspail, like common starch. It is very slightly soluble in cold water, but very soluble in boiling water, from which it is deposited as the solution cools. It is slightly soluble in boiling alcohol. Iodine gives it a yellow tint: this distinguishes it from ordinary starch.

4. *Bitter Extractive.*—In this resides the tonic property of elecampane.

Physiological Effects.—An aromatic tonic. It acts as a gentle stimulant to the organs of secretion, and is termed diaphoretic, diuretic, and expectorant. Large doses cause nausea and vomiting. It was formerly supposed to possess emmenagogue properties. In its operation it is allied to sweet-flag (see p. 611) and senega.

Uses.—It is rarely employed now by the medical practitioner. It has been used in pulmonary affections (as catarrh), attended with profuse secretion and accumulation of mucus, but without febrile disorder or heat of skin. In dyspepsia, attended with relaxation and debility, it has been administered with benefit. It has also been employed in the exanthemata to promote the eruption.

Administration.—Dose of the *powder*, ℈j. to ʒij.; of the *decoction* (prepared by boiling ℥ss. of the root in Oj. of water), f℥j. to f℥ij.

Tribe III.—*Senecionideæ.*

An'themis nob'ilis, Linn. L. E. D.—*Common Chamomile.*

Sex. Sys. Syngenesia, Polygamia superflua.

(Flores simplices, *L.*—Flowers, *E.*—Flores, *D.*)

History.—The ἀνθεμὶς of Dioscorides (lib. iii. cap. 154) is *Anthemis Chia* (*Prodr. Fl. Græcæ*, vol. ii. p. 189).

Botany. *Gen. Char.*—*Head* many-flowered, heterogamous; *florets* of the ray female, in one row, ligulate (rarely none, or somewhat tubular); of the disc hermaphrodite, tubular, five-toothed. *Receptacle* convex, oblong, or conical; covered with membranous paleæ between the flowers. *Involucre* imbricated, in a few rows. Arms of the *style* without appendages at the apex. *Achene* tapering or obtusely four-cornered, striated or smooth. *Pappus* either wanting or a very short, entire, or halved membrane; sometimes auriculate at the inside (D. C.)

Sp. Char. — *Stem* erect, simple, ramose, downy-villose. *Leaves* downy, sessile, pinnatisect; segments split into many linear-setaceous lobes. *Branches* flowery, naked, one-headed at the apex. Scales of the *involucre* obtuse, hyaline at the margin. Paleæ of the *receptacle* lanceolate, pointless, somewhat shorter than the floret, slightly eroded at the margin (D. C.)

Roots shiny, with long fibres. *Stems* in a wild state prostrate, in gardens more upright, a span long, hollow, round. *Florets* of the disc yellow; of the ray white. *Receptacle* convex.

Anthemis nobilis flore pleno, D. C. *Double Chamomile.*—In this variety, the yellow tubular florets of the disc are entirely or partially converted into white ligulate florets.

Sir J. Smith (*Eng. Fl.* vol. iii. p. 457) speaks of the *discoid variety*, destitute of rays, as being more rare. It ought perhaps, he adds, to be preferred for medicinal use.

Hab.—Indigenous; on open gravelly pastures or commons. Perennial. Flowers from June to September. Cultivated at Mitcham and other places, for the London market.

Description.—The floral heads (*flores chamæmeli romani* seu *anthemidis nobilis*) have a strong and peculiar odour, and a bitter aromatic taste. When fresh, they exhale a strong and peculiar fragrancy when rubbed. They should be dried in the shade. The *single flowers* (*flores simplices*, Ph. L.) are to be preferred, as they have the largest yellow discs, in which the volatile oil resides. The large *double flowers* (*chamæmelum flore pleno*, Lewis; *chamæmelum nobili flore multiplici*, C. Bauhin), however, are usually the most esteemed: but as their yellow discs containing the oil are small, or scarcely any, they contain less volatile oil.

Composition.—These flowers have not yet been analyzed. The most important constituents are *volatile oil*, *bitter extractive*, and *tannic acid*.

1. *Volatile Oil* (*Oleum Anthemidis nobilis* seu *Chamæmeli romani*).—When first drawn its colour is pale blue, but by exposure to light and air it becomes yellow or brownish. Lewis (*Mat. Med.*) says it is yellow, with a cast of greenish or brown. Its sp. gr. is 0·9083. When fresh, its odour is strong and peculiar, and its taste pungent and nauseous.

2. *Bitter Extractive.*—The bitter principle of chamomiles is soluble in both water and alcohol.

3. *Tannic Acid.*—The cold watery infusion of the flowers is darkened by sesquichloride of iron, and forms a precipitate with gelatin.

Freudenthal (Gmelin, *Handb. d. Chem.* ii. 1292) analyzed the dried flowers of the *Common Wild Chamomile* (*Matricaria Chamomilla*), and found them to consist of *volatile oil* 0·28, *resin* 7·89, *bitter extractive* 8·57, *gum* 7·39, *bitartrate of potash* 5·31, *phosphate of lime* 0·97, *woody fibre*, *soluble albumen*, *water*, and *loss* 69·6.

Physiological Effects.—Chamomiles produce the effects of the *aromatic bitter tonics* before alluded to (see p. 80): their aromatic qualities depend on the volatile oil, their stomachic and tonic qualities on bitter extractive and tannic acid. In large doses they act as an emetic.

Uses.—Chamomiles are an exceedingly useful stomachic and tonic in *dyspepsia*, with a languid and enfeebled state of stomach and general debility. As a remedy for *intermittents*, though they have gained considerable celebrity, they are inferior to many other medicines. The oil is sometimes used to relieve *flatulency*, *griping*, and *eructation*; and the warm infusion is employed as an *emetic*.

Administration.—The *powder* is rarely employed, on account of the inconvenient bulk of the requisite quantity, and its tendency to excite nausea. Dose grs. x. to ʒss. or more. The *infusion* is the more elegant preparation: this, as well as the *extract* and *oil*, are officinal. *Fomentations of Chamomile flowers* consist of the infusion or decoction, and are used quite hot; but they present no advantage over water of the same temperature. *Flannel bags filled with chamomiles and soaked in hot water*, are useful topical agents for the application of moist warmth, on account of their retention of heat.

1. *Infusum Anthemidis*, L. E. *Infusum Chamæmeli*, D. *Chamomile Tea* (Chamomile, ℥v.; Boiling [distilled] Water, Oj. Macerate for ten [twenty, *E.*] minutes [twenty-hours, *D.*] in a lightly-covered vessel, and strain [through linen, *D.* or calico, *E.*]).—It is taken warm, to excite gentle vomiting, or to promote the operation of an emetic. The cold infusion is usefully employed as a domestic stomachic bitter and tonic in dyspepsia. Dose of the cold infusion, f℥j. to f℥ij.; of the warm infusion, *ad libitum*.

2. *Extractum Anthemidis*, E.; *Extractum Chamæmeli*, D. (Chamomile, Oj.; boil it with a gallon of water down to four pints; filter the liquor hot; evaporate in the vapour-bath to the due consistence, *E.*) One-hundred weight of the flowers yields about forty-eight pounds of extract. The volatile oil is dissipated during the preparation. The extract is a bitter stomachic and tonic. It is generally used as a vehicle for the exhibition of other tonics in the form of pills. Conjoined with the oil of chamomile, we can obtain from it all the effects of the recent flowers. Dose, grs. x. to ℈j.

3. *Oleum Anthemidis*, L. E. *Oleum Chamæmeli* (obtained by submitting the flowers to distillation with water).—One-hundred weight of

flowers yields from ℥iss. to ℥ij. of oil. The oil of the shops is frequently brought from abroad, and is probably the produce of another plant (*Matricaria Chamomilla*). Oil of chamomile is stimulant and antispasmodic. It is a frequent addition to tonic and cathartic pills; it communicates stimulant qualities to the former, and is believed to check the griping caused by the latter. It is occasionally exhibited in the form of elæosaccharum (see p. 77). Dose, ♏j. to ♏v.

Anacy'clus Pyreth'rum, D. C., E.—*Pellitory of Spain.*

An'themis Pyreth'rum, *L. D.*

(Radix, *L. D.*—Root, *E.*)

History.—Dioscorides (lib. iii. cap. 86) was acquainted with *πύρεθρον*, and speaks of its use in toothache. The word *pyrethrum* is mentioned once only by Pliny (*Hist. Nat.* lib. xxviii. cap. 42, ed. Valp.)

Botany. *Gen. Char.*—*Head* many-flowered, heterogamous. *Florets* of the ray female, sterile, ligulate or somewhat so, very rarely tubular; of the disc hermaphrodite, with five callous teeth. *Receptacle* conical or convex, paleaceous. *Involucre* in few rows, somewhat campanulate, shorter than the disc. All the *corollas* with an obcompressed, two-winged, exappendiculate tube. *Style* of the disc, with exappendiculate branches. *Achene* flat, obcompressed, bordered with broad, entire wings. *Pappus* short, irregular, tooth-letted, somewhat continuous with the wings on the inner side (D. C.)

Sp. Char.—*Stems* several, procumbent, somewhat branched, pubescent. Radical *leaves*, expanded, petiolated, smoothish, pinnatisect; the segments pinnatipartite, with linear subulate lobes; the cauline leaves sessile. *Branches* one-headed. *Involucral* scales lanceolate, acuminate, brown at the margin. *Receptacle* convex, with oblong-obovate, obtuse paleæ (D. C.)

Root fusiform, fleshy, very pungent, and when fresh, producing a sensation of extreme cold, followed by heat when handled. *Florets* of the ray white; on the upper side purplish beneath; of the disc yellow.

Hab.—Barbary, Arabia, Syria, and perhaps Candia.

Description.—The root (*radix pyrethri*) is imported from the Levant packed in bales. It consists of inodorous pieces, about the length and thickness of the little finger, covered with a thick brown bark, studded with black shining points, breaking with a resinous fracture, and presenting internally a radiated structure. When chewed it excites a pricking sensation in the lips and tongue, and a glowing heat. None has been imported since 1836, when duty (6d. per lb.) was paid on 420 lbs.

Composition.—It was analyzed by John (Gmelin, *Handb. d. Chem.* ii. 1292), by Gautier (*Journ. de Pharm.* iv. 49), by Parisel (*Ibid.* xix. 251), and, lastly, by Koene (*Ann. de Chim. Phys.* lix. 327). Parisel obtained *acrid matter* (*pyrethrin*) 3, *inulin* 25, *gum* 11, *tannin* 0·55, *colouring matter* 12, *lignin* 45, *chloride of potassium* 0·79, *silica* 0·85, and *iron* a trace.

Acrid matter (*Pyrethrin; Resin*).—In this resides the activity of the root. It exists in greater abundance in the bark than in the wood. It is brown, soft, has a burning acrid taste, is insoluble in water, but soluble in ether and alcohol; still more so in acetic acid, and the oils (volatile and fixed). Koene says, pyrethrin consists of three substances:—

α. *A brown acrid resin*, soluble in alcohol, insoluble in water or caustic potash.
β. *An acrid brown fixed oil*, soluble in potash.
γ. *A yellow acrid oil*, soluble in potash.

PHYSIOLOGICAL EFFECTS.—Pellitory is an energetic local irritant. Applied to the skin, it acts as a rubefacient.

USES.—Scarcely ever employed internally. Its principal use is to yield a tincture for the relief of toothache. As a masticatory and sialogogue it is chewed in some rheumatic and neuralgic affections of the head and face, and in palsy of the tongue. In relaxation of the uvula it is occasionally employed in the form of gargle. It was formerly employed internally as a gastric stimulant.

ADMINISTRATION.—Dose, as a *masticatory*, ʒss. to ʒj.; *Tinctura pyrethri* (composed of pyrethrum; water, of each, one part; rectified spirit, five parts) is used to relieve toothache.

Artemi'sia Absin'thium, L. E. D.—*Common Wormwood.*

Sex. Syst. Syngenesia, Polygamia superflua.

(Herb, *E.*—Summitates florentes, *D.*)

HISTORY.—In all probability this plant is the ἀψίνθιον of Hippocrates (*Opera*, pp. 491, 587, &c. ed. Fæs.) and Dioscorides (lib. iii. cap. 26). The term *wormwood* occurs several times in our translation of the Old Testament (*Deut.* xxix. 18; *Prov.* v. 4); but the plant meant would appear to be both bitter and poisonous.

BOTANY. *GEN. CHAR.*—*Heads* discoidal, homogamous or heterogamous. *Florets* of the ray in one row, usually female and three-toothed, with a long bifid protruding style; of the disc five-toothed, hermaphrodite, or by the abortion of the ovary, sterile or male. *Involucral* scales imbricated, dry, scarious at the edge. *Receptacle* without paleæ, flattish or convex, naked or fringed with hairs. *Achene* obovate, bald, with a minute epigynous disc (D. C.)

SP. CHAR.—An erect *undershrub*. *Leaves* silky, hoary, tripinnatisect; the segments lanceolate, somewhat dentate, obtuse. The *heads* small, racemose-paniculate, globose, nodding. Exterior scales of the *involucre* somewhat silky, linear, lax; interior ones rounded, scariose, somewhat naked (D. C.)

Herb covered with silky hoariness, intensely bitter, with a strong peculiar odour. *Stems* numerous, about a foot high. *Leaves* rather greener on the upper side; lower ones on long footstalks; upper on shorter, broader, somewhat winged ones. *Florets* pale yellow, or buff.

HAB.—Indigenous; in waste grounds. Perennial. Flowers in August.

DESCRIPTION.—The dried herb with the flowers, or the tops (*herba* seu *summitates absinthii*), have a whitish-gray appearance, a soft feel, a strong aromatic and somewhat unpleasant odour, and an extremely bitter aromatic taste. The cold watery infusion becomes grayish, olive-green, and turbid (*tannate of iron*) on the addition of sesquichloride of iron.

COMPOSITION.—This plant has been analyzed by Kunsemuller (Pfaff, *Mat. Med.* iv. 334), by Braconnot (*Bull. de Pharm.* v. 549), and by Haynes (Geiger, *Handb. d. Pharm.* ii. 1509). The extract was examined by Leonardi (*Journ. de Pharm.* xiv. 620). Braconnot found *volatile oil*

0·15, *green resin* 0·50, *bitter resin* 0·233, *albumen* 1·250, *starch* 0·133, *azotized matter*, having little taste, 1·333, *bitter azotized matter* 3·0, *woody fibre* 10·833, *absinthate of potash* 0·917, *nitrate of potash* 0.333, *sulphate of potash and chloride of potassium* traces, *water* 61·2.

1. *Volatile oil* (*Oleum Absinthii*).—Green, sometimes yellow or brownish oil, having a strong odour of wormwood, and an acrid, bitterish, peculiar taste. Its sp. gr. is 0·972. Nitric acid colours it green, then blue, afterwards brown.

2. *Bitter principle* (*Absinthin*).—Caventou (*Journ. de Chim. Méd.* t. iv. p. 556) obtained what he calls the *pure bitter principle* by precipitating an infusion of wormwood by acetate of lead, and separating the excess of lead by sulphuretted hydrogen. The liquor was then evaporated to dryness, and the extract digested in alcohol mixed with ether; and the solution abandoned to spontaneous evaporation. The product was a very bitter matter, in brown ramifications. By heat no crystalline sublimate could be obtained.

3. *Absinthic acid.*—May be precipitated, according to Braconnot, from the watery infusion of wormwood by acetate of lead. It is very acid, uncrystallizable, and deliquescent. It does not precipitate the solutions of the nitrates of lead, mercury, and silver; but causes flocculent precipitates when dropped into barytes or lime-water. *Absinthate of ammonia* crystallizes in quadrilateral prisms, insoluble in alcohol.

4. *Salt of Wormwood* (*Sal Absinthii*).—This is impure carbonate of potash, obtained by incinerating wormwood.

Physiological Effects.—*In moderate doses* it produces the ordinary effects of the *aromatic bitter tonics* (see p. 80). Its bitter principle becomes absorbed: hence the flesh and milk of animals fed with it are rendered bitter. Borrich (*Act. Hafn.* vol. ii. p. 165) says, that the milk rendered bitter by it proves noxious to the infant.

Large doses irritate the stomach and excite the vascular system. A specific influence over the nervous system, characterized by headache, giddiness, &c. has been ascribed to it (see Lindestolpe, in Murray, *App. Med.* i. 183; and Kraus, *Heilmittell.* p. 422). This has usually been supposed to depend on the volatile oil; but a similar power has been assigned to the bitter principle.

Uses.—Wormwood is but little employed in medicine. It is applicable to dyspepsia occurring in debilitated and torpid constitutions. It was at one time celebrated for the cure of intermittents; but it has been superseded by other and more powerful febrifuges. It is said to be efficacious as an anthelmintic, but it is very rarely employed as such. It has been used as a substitute for *Artemisia vulgaris* in epilepsy.

Administration.—Dose of the *powder*, ℈j. to ʒj.; of the *infusion* (prepared by macerating ℥j. of the dried herb in Oj. of boiling water), f℥j. to f℥ij.

Extractum Artemisiæ Absinthii, D. (Prepared in the usual way from the tops of wormwood, by water).—It possesses the bitterness of the plant, but is devoid of the odour, flavour, and aromatic qualities dependent on the volatile oil. It is stomachic and tonic. Dose, gr. x. to ℈j.

Artemi'sia Mox'a, D. C.—*Moxa-weed.*

Sex. Syst. Syngenesia, Polygamia superflua.

(Folia; Moxa).

History.—The *moxa* is a small mass (usually cylindrical or pyramidal) of combustible vegetable matter employed for effecting cauterization (*moxybustion* of Percy, *Dict. Sc. Méd.* xxxiv. 474). It has long been known that the Chinese and Japanese prepared it from a species of Artemisia (Loureiro, *Fl. Cochinchinensis*, ii. 492; Thunberg, *Voyages au Japon*, &c. iv. 74). The Dublin College has adopted *A. chinensis* and *A. indica* as yielding it. But Dr. Lindley (*Fl. Med.* 463) says it is from the *A. Moxa*, D. C., and not from A. chinensis, that it is prepared; and Dr. Roxburgh (*Fl. Ind.* iii. 420) observes that the A. indica has none of the soft white down on the under side of its leaves, of which moxa is made in Japan and China.

BOTANY. *GEN. CHAR.*—See *Artemisia Absinthium*.

SP. CHAR.—Shrubby. *Leaves* hoary, becoming naked, bipinnatisect; segments linear-lanceolate, obtuse. *Heads* middle-sized, globose, drooping, racemose-paniculate. *Scales* of the involucre membranaceo-scariose at the apex. *Corollas* smooth (D. C.)—An undershrub.

HAB.—China.

PREPARATION.—The *Chinese* and *Japanese moxa* is said by some to be prepared from the cottony or woolly covering of the leaves of the Artemisia. Thunberg (*op. cit.*), however, states, that in Japan the dried tops and leaves are beat till they become like tow: this substance is then rubbed betwixt the hands till the harder fibres and membranes are separated, and there remains nothing but a fine cotton.

European moxas are usually made with either cotton-wool (which has been soaked in a solution of nitrate or chlorate of potash) or the pith of the sun-flower (*Helianthus annuus*), which contains naturally nitrate of potash. Their shape is either cylindrical or conical: their size is variable. *Percy's moxas*, prepared by Robinet, are usually found in the London shops. They consist of pith, rolled in cotton, and enveloped in muslin.

PHYSIOLOGICAL EFFECTS.—These are two-fold, *primary* and *secondary*.

1. *Primary Effects.*—The moxa first excites an agreeable sensation of heat. This is speedily followed by pain, which progressively increases until it becomes most severe, and the vitality of the part is destroyed. The parts immediately around the eschar are intensely red. The eschar may be deep or superficial, according to the time the moxa is kept in contact with the skin. The action of the moxa differs from that of the metallic actual cautery in this important particular, that the heat acts slowly, increases gradually, and penetrates to a greater depth.

2. *Secondary Effects.*—These consist in the production of inflammation, by which the eschar is separated, and establishment of suppuration more or less profound, according to circumstances.

USES.—Moxa is employed in the treatment of diseases, on the principle of counter-irritation, before explained (p. 45). This, indeed, has been denied by those (see Boyle, *Treat. on Moxa*, p. 88, 1825), who consider the production of a discharge as the only mode of effecting counter-irritation.

Moxa is adapted for chronic diseases and maladies characterized by lesions of sensation or motion. It is, on the other hand, injurious in all acute inflammatory diseases.

The following is a list of the principal diseases against which moxa has been employed; and for further information respecting them, I must refer the reader to the writings of Larrey (*Dict. des Scien. Méd.*, art. *Moxa*), Boyle (*op. supra cit.*), and Wallace (*Physiol. Enq. resp. Moxa*, 1827), as the limits and objects of this work do not admit of further details.

1. *Paralysis of the sentient or motor nerves.*—Great benefit has been obtained by the use of moxa in this class of diseases. Amaurosis, deafness, loss of voice and speech, hemiplegia, and especially paraplegia, have been relieved by it.

2. *Painful affections of nerves, muscles*, or the *fibrous tissues;* as neuralgia, sciatica, lumbago, and chronic rheumatism.

3. *Spasmodic diseases*, either of particular parts, or the general system; as spasmodic asthma, epilepsy, &c.

4. *Diseased joints and spinal maladies*; as chronic articular inflammation, white swelling, stiff joint, the hip-joint disease, curvature of the spine, &c.

5. *Visceral diseases*; as organic diseases of the brain, phthisis pulmonalis, chronic hepatitis and splenitis, &c.

APPLICATION.—In the employment of moxa, two points deserve especial attention: first, the parts proper or otherwise for its use; and secondly, the mode of applying it.

1. *Parts proper or improper for its application.*—The moxa has been applied to nearly every part of the body. Larrey, however, considers the following parts improper for its application:—

1. All that part of the skull covered by skin and pericranium only.
2. The eyelids, nose, ears, larynx, trachea, sternum, glandular parts of the breasts, linea alba, and parts of generation.
3. Over the course of superficial tendons, articular prominences, where there is danger of injuring the articular capsules, and projecting points of bone.

2. *Mode of application.*—The moxa is to be set on fire at the summit, and its base is then applied (by a *porte-moxa*, pair of forceps, wire, or other convenient instrument) to the skin. To prevent the surrounding parts being burnt by sparks, Larrey recommends them to be previously covered with a wet rag, perforated in the centre, to admit the base of the moxa. If the combustion flag, it may be kept up by the breath, blowpipe, or bellows. After the combustion is over, Larrey recommends the immediate application of liquor ammoniæ, to repress excessive inflammation and suppuration.

Tanace'tum vulga're, Linn. D.—*Common Tansy.*

Sex. Syst. Syngenesia, Polygamia superflua.

(Folia, *D.*)

HISTORY.—Tansy was ordered to be cultivated in gardens by Charlemagne (Sprengel, *Hist. Rei Herb.* i. 220).

BOTANY. *GEN. CHAR.*—*Heads* either homogamous or heterogamous; namely, florets of the ray female, in one row, usually three- to four-toothed. *Receptacle* naked, convex. *Involucre* campanulate, imbricated. *Corollas* of the disc four- to five- toothed. *Achene* sessile, angular, smooth, with a large epigynous disc. *Pappus* either none, or membranous, coronet-shaped, minute; either entire or equally toothed, or somewhat unequal, being more evident on the external side (D. C.)

SP. CHAR.—*Stem* herbaceous, erect, smooth. *Leaves* smoothish, bipinnatipartite, the rachis and lobes inciso-serrate. *Corymbus* many-headed. Internal scales of the *involucre* obtuse, scariose at the apex. *Pappus* short, equal, five-lobed (D. C.)

Root moderately creeping. *Stems* 1½ to 2 feet high. *Leaves* dark green. *Florets* golden yellow; the marginal ones often wanting.—There are three varieties of it,—the *common*, the *curled* (generally preferred), and the *variegated* (chiefly for ornament).

Hab.—Indigenous; hilly pastures, hedges, road-sides. Cultivated in gardens as a medicinal—or pot—herb, or for ornament.

Description.—The herb and flowers (*herba* et *flores tanaceti*) have a disagreeable, aromatic odour, and a nauseous, strong, aromatic, bitter taste. The infusion is rendered dark green and turbid (*tannate of iron*) by sesquichloride of iron.

Composition.—Both leaves and flowers have been analyzed by Fromherz and by Peschier (Gmelin, *Handb. d. Chem.* ii. 1290. The constituents of the leaves, according to Peschier, are *volatile oil, fatty oil, wax* or *stearine, chlorophylle, bitter resin, yellow colouring matter, tannin with gallic acid, bitter extractive, gum, woody fibre, tanacetic acid.*

1. *Volatile Oil* (*Oleum Tanaceti*).—Yellow, sometimes green. Has the peculiar odour of the plant; and a warm, bitter taste. Its sp. gr. is 0·952.

2. *Bitter Matter.*—This is the substance usually denominated extractive; but, according to Peschier, it is in part resin.

3. *Tanacetic Acid.*—Crystallizable. Precipitates lime, baryta, and oxide of lead. With a solution of acetate of copper it causes a precipitate.

Physiological Effects.—Tansy produces the usual effects of the *aromatic bitter tonics* (see p. 80). "A fatal case of poisoning with half an ounce of oil of tansy is recorded in the *Medical Magazine* for Nov. 1834. Frequent and violent clonic spasms were experienced, with much disturbance of respiration; and the action of the heart gradually became weaker till death took place from its entire suspension. No inflammation of the stomach or bowels was discovered upon dissection" (*United States Disp.* from the *Am. Journ. of the Med. Sciences*, xvi. 256).

Uses.—The young leaves are occasionally employed by the cook to give colour and flavour to puddings, and in omelets and other cakes. In medicine the plant is rarely employed by the regular practitioner; but it has been recommended in dyspepsia, intermittents, and gout (Cullen, *Mat. Med.* ii.) Its principal use, however, is as a vermifuge.

Administration.—*Tansy tea* (prepared by infusing ℥ij. of the herb in Oj. of boiling water) may be taken in doses of from f℥j. to f℥iij. A drop or two of the *oil* may be added to vermifuge powders and pills. The *seeds* have been used instead of *semina santonici*.

Ar'nica monta'na, Linn. D.—*Mountain Arnica.*

Sex. Syst. Syngenesia, Polygamia superflua.

(Flores, Folia, et Radix, *D.*)

History.—This plant does not appear to have been known to the ancients; at least no undoubted mention of it occurs in their writings.

Botany. *Gen. Char.*—*Head* many-flowered, heterogamous. *Florets* of the ray in one row, female, ligulate; of the disc, hermaphrodite, tubular, five-toothed. *Involucre* campanulate, in two rows, with linear-lanceolate equal scales. *Receptacle* fringed, hairy. Tube of the *corolla* shaggy. Rudiments of sterile *stamens* sometimes remaining in the ligulæ. *Style* of the disc with long arms, covered by down running a long way down, and truncated or terminated by a short cone. *Achene* somewhat cylindrical, tapering to each end, somewhat ribbed and hairy. *Pappus* in one row, composed of close, rigid, rough hairs (D. C.)

Sp. Char.—Radical *leaves* obovate, entire, five-rowed; the cauline vases in one or two pairs. *Stem* one- to three-headed. *Involucres* rough, with glands (D. C.)

Perennial. *Stem* hairy, about one foot high. *Florets* yellow, tinged with brown.

Hab.—Meadows of the cooler parts of Europe, from the sea-shore to the limits of eternal snow.

Description.—The root (*radix arnicæ*) consists of a cylindrical caudex, from two to three inches long and two or three lines thick, from which many fibres arise. It is brown externally, has a disagreeable yet aromatic odour, and an acrid nauseous taste. The dried flowers, (*flores arnicæ*) are yellowish, and have a similar taste and smell to the root. The leaves (*folia arnicæ*) have a like smell.

Composition.—Pfaff (*Mat. Med.* Bd. iii. S. 210) found in the root *volatile oil* 1·5, *acrid resin* 5·0, *extractive* 32·0, *gum* 9·0, and *woody fibre* 5·5. The root has also been examined by Weissenburger (Goebel and Kunze, *Pharm. Waarenk.* Bd. ii. S. 177). Chevallier and Lassaigne (*Journ. de Pharm.* t. v. p. 248) analyzed the flowers, and found in them *resin*, *bitter acrid matter* (*cytisin*), *yellow colouring matter*, *gum*, *albumen*, and *gallic acid*. In the ashes were salts of potash, and lime, and silica. Dr. A. T. Thomson (*Lond. Dispens.* p. 213, 9th ed.) is of opinion that the igasurate of strychnia (or brucia) exists in the plant.

1. *Volatile Oil.*—The oil obtained from the root, by Pfaff, was yellowish, lighter than water, and had a burning aromatic taste. The volatile oil of the flowers is blue.

2. *Resin* (*Arnicin*).—The acridity of the root and flowers resides, according to Pfaff, in the resin, which is soluble in alcohol.

3. *Extractive Matter.*—According to Chevallier and Lassaigne, this is nauseous, acrid, bitter, and soluble in both water and spirit. They consider it to be analogous to *cytisin.*

Physiological Effects. (*a.*) *On animals.* — The effects of the flowers of Arnica on horses have been examined by Viborg (Wibmer, *Wirk. d. Arzneim. ü. Gifte*, i. 231). An infusion of six drachms of the flowers quickened the pulse, and acted as a diuretic. An infusion, thrown into the veins, caused insensibility.

(*b.*) *On man.*—Jörg and his pupils have submitted themselves to the influence of this plant (*Ibid.* S. 226). From their observations, as well as from the testimony of others, Arnica appears to possess acrid properties. When swallowed, it causes burning in the throat, nausea, vomiting, gastric pains, and loss of appetite. The active principle becomes absorbed, quickens the pulse and respiration, and promotes diaphoresis and diuresis. Furthermore, it appears to exert a specific influence over the nervous system, causing headache, giddiness, and disturbed sleep. Sundelin (*Hand. d. Sp. Heilm.* ii. 170, 3tte Aufl.) considers it to be closely allied in operation to vinegar, from which, he says, it differs in its stimulating influence over the nervous system, and in its causing constipation.

Use.—Arnica is indicated in diseases characterized by debility, torpor, and inactivity. It is administered as a stimulant to the general system in various debilitated conditions, and in typhoid fevers; to the nervous system in deficient sensibility, as amaurosis; to the muscular system, in paralysis; to the vascular system and secreting organs when the action of those is languid, and requires to have its energy increased, as in some forms of dropsy, chlorosis, amenorrhœa, asthenic inflammation, &c. Furthermore, it has been employed, empirically, in some maladies, as diarrhœa, dysentery, &c. It is rarely employed in this country.

Administration.—Dose of the *powder*, grs. v. to grs. x.; of the infusion (prepared by macerating ℥ss. in Oj. of water), from f℥ss. to f℥j.

Other Officinal Senecionideæ.

The substance kept in the shops under the name of *Wormseed* (*semen santonicum, semen cinæ, semen sanctum, semen contra, semen sementina*, &c.), is erroneously declared by the *Dublin College* to be the seeds (*semina*) of *Artemis'ia Santon'ica*. A very superficial examination shows that the substance sold under this name consists of broken peduncles, mixed with the calyx and flower-buds, and not of seeds. Furthermore, the plant which Dr. Woodville (*Med. Botany*) has denominated *A. Santonica*, is said by Decandolle (*Prodr.* vi. 104) to be *A. maritima*, var. *β. suavolens*. Martius (*Pharmakogn.*) describes three kinds of wormseed; but I am acquainted with one kind only, which is imported from the Levant. It is used as a vermifuge, in doses of from gr. x. to ʒss., repeated night and morning, and succeeded by a brisk purge.

Tribe IV. *Cynareæ.*

Lap'pa mi'nor, Decandolle.—*Common Burdock* or *Clot-bur*.

Arc'tium Lap'pa, *D.*

Sex. Syst. Syngenesia, Polygamia æqualis.

(Semina et Radix, *D.*)

History.—This, according to Sprengel (*Hist. Rei Herb.* i. 101 & 185), is the ἀπαρίνη, *altera*, of Theophrastus (*Hist. Plant.* vii. 14), the ἀρκεῖον of Dioscorides (iv. 107).

Botany. *Gen. Char.*—*Head* homogamous, many-flowered and equal-flowered. *Involucre*, globose; the scales coriaceous, imbricated, close pressed at the base, then subulate, with a horny, hooked, inflexed point. *Receptacle* rather fleshy, flat, with stiff subulate fringes. *Corollas* five-cleft, regular, with a ten-nerved tube. *Stamens* with papillose *filaments*; the *anthers* terminated by filiform appendages, and with subulate tails at the base. *Stigmas* free at the apex, diverging, curved outwards. *Fruit* oblong, laterally compressed, smooth, transversely wrinkled; the areola at their base scarcely oblique. *Pappus* short, in many rows; the hairs deciduous, filiform, not collected into a ring (D. C.)

Sp. Char.—*Involucre* smooth; the scales serrulated beyond the middle; smooth at the base only; the inner ones few, not radiating. *Heads* somewhat racemose (D. C.)

Root tapering, fleshy. *Stem* erect, three feet or more high. *Leaves* stalked, cordate; the radical ones very large, and often slightly toothed. *Florets* purple.

Hab.—Indigenous; waste places and way-sides; commons. Flowers in July and August.

Physiological Effects.—The *root* and *leaves* have been considered to possess mild resolvent, diaphoretic, and diuretic properties (Murray, *App. Med.* i. 134). Lieutaud (*Syn. Prax. Med.* t. i. p. 528, 1770) says, the root promotes the lochial discharge. The *seeds* are diuretic, and, according to Linnæus, (*Mat. Med.*) purgative.

Uses.—The root, leaves, and seeds, have been employed as alteratives and resolvents in gouty, rheumatic, calculous, and venereal complaints.

Administration.—The *decoction of the root* (prepared by boiling ℥ij. of the recent root in Oiij. of water down to Oij.) may be taken to the extent of a pint daily. The dose of the *seeds* is ℨj.

Cni'cus benedic'tus, Linn. D.—*Blessed Thistle.*

Centau'rea benedicta, *Linn.*

(Folia, *D.*)

History.—Sprengel (*Hist. Rei Herb.* i. 102) thinks that this plant is, perhaps, the ἄκορνα of Theophrastus (*Hist. Plant.* vi. 4).

Botany. *Gen. Char.*—*Involucre* ovate; the scales close-pressed, coriaceous, extended into a long, hard, spinous, pinnate appendix; the lateral spines conical and distant. *Corollas* of the ray sterile, slender, almost as long as the disc. *Fruit* longitudinally and regularly striated, smooth; with a broad, lateral areola. *Pappus* triple, as it were, the outer being the horny, very short, crenated margin of the fruit; the intermediate consisting of ten long stiff setæ; the inner of ten short setæ; all the setæ alternating with each other (D. C.)

Sp. Char.—The only species.

An annual, branched, woolly *herb*. *Leaves* amplexicaul, somewhat decurrent, nearly entire or deeply pinnatifid. *Heads* terminal, bracteate. *Florets* yellow.

Hab.—South of Europe, the Levant, Persia; introduced into China.

Composition.—The herb was analyzed by Soltmann (Pfaff, *Mat. Med.* vi. 171), and the leaves by Morin (*Journ. Chim.-Méd.* iii. 105). The latter found *volatile oil*, *bitter principle*, *resin*, *chlorophylle*, *fixed oil*, *uncrystallizable sugar*, *gum*, *albumen*, *supermalate of lime*, *several mineral salts*, some *metallic oxides*, and *traces of sulphur*.

1. *Bitter principle* (*Cnicin*).—A brown, bitter substance, soluble in alcohol, ether, and boiling water; insoluble in fixed oils. Its aqueous solution forms a precipitate on the addition of diacetate of lead. It gives no trace of nitrogen when decomposed by heat.

2. *Resin.*—Brownish, insipid, inodorous; very soluble in alcohol and alkaline solutions, but is insoluble in ether.

Physiological Effects.—The herb is tonic and mildly diaphoretic: its decoction causes vomiting. The seeds are diaphoretic (Murray, *App. Med.* i. 151-3).

Uses.—The cold infusion is employed as a tonic in debilitated conditions of the stomach. Taken warm in bed, the infusion has been given as a sudorific in various chronic diseases. The decoction has been employed to promote the operation of emetics (Lewis, *Mat. Med.*)

Administration.—The *infusion* (prepared by digesting ℥ss. of the leaves in Oj. of water) is given in doses of from f℥j. to ℥ij., as a tonic. The *decoction* (made with double or treble the quantity of leaves) is used in the same dose.

Fig. 188.

Carthamus tinctorius.

Other Officinal Cynareæ.

The flowers of the *Car'thamus tincto'rius* are imported, for the use of dyers, in flaky masses, from the East Indies and other places, under the name of *Safflower*, or *Bastard Saffron*. They contain two colouring matters—one *yellow*, soluble in water, the other *red* (*carthamin* or *carthamic acid*), soluble in alkaline solutions. Safflower is used to adulterate *hay-saffron*, and in the manufacture of *cake-saffron* (see p. 674-5). The mode of detecting the fraud has been already pointed out.

Tribe V. *Cichoraceæ.*

Tarax'acum Dens-Leo'nis, Desf. E.—*Common Dandelion.*

Leon'todon Tarax'acum, *Linn. L. D.*

Sex. Syst. Syngenesia, Polygamia æqualis.

(Radix, *L.*—Root, *E.*—Herba et Radix, *D.*)

History.—As this plant is a native of Greece (see *Prodr. Fl. Græcæ*, ii. 129), it must have been known to the ancients. Sprengel thinks (*Hist. Rei Herb.* i. 100) that it is the ἀφάκη of Theophrastus (*Hist. Plant.* vii. 8).

Botany. *Gen. Char.*—*Head* many-flowered. *Involucre* double; external scales small, closely pressed, spreading, or reflexed; internal ones in one row, erect; all frequently callous-horned at the apex. *Receptacle* naked. *Achene* oblong, striated, muricate near the small ribs or spinellose at the apex, terminating in a long beak. *Pappose* hairy, in many rows, very white (D. C.)

Sp. Char.—Quite smooth. *Leaves* unequally and acutely runcinate; the lobes triangular, toothed inwardly. Scales of the *involucre* hornless, the external ones reflexed. *Achenes* muricate at the apex (D. C.)

Root perennial. *Leaves* numerous, bright shining green. *Scapes* one or more, erect, brittle. *Heads* expanded in the morning and in fine weather only. *Florets* golden yellow.

Hab.—Indigenous; meadows and pastures every where. Flowers all the summer.

Description.—The fresh root (*radix taraxaci*) is tap-shaped, branched, fleshy, abounding in milky juice. Externally it is dull-yellow or brownish, internally white. It is without odour: its taste is bitter (especially in the summer). If dug up in the winter the root loses on drying 75 per cent. of water. The cold watery infusion of the dried root deposits a dirty-gray flocculent precipitate on the addition of sesquichloride of iron.

Composition.—The milky juice of the root has been analyzed by John (Gmelin, *Handb. d. Chem.* ii. 1287), who found in it *caoutchouc*, *bitter matter*, traces of *resin*, *sugar*, and *gum*, *free acid*, *phosphates*, *sulphates*, and *hydrochlorates of potash and lime*, and *water*. The root also contains 12 per cent. of *inulin*. Mr. Squire (Brande's *Dict. of Mat. Med. and Pharm.* p. 532) says, the expressed juice contains *gum*, *albumen*, *gluten*, *an odorous principle*, *extractive*, and *a peculiar crystallizable bitter principle*, soluble in alcohol and water.

The root washed, crushed, and pressed, yields about half its weight of juice. Except in the months of April and May, when it is very aqueous, this juice spontaneously coagulates, and becomes of a fawn-colour. The quantity of extract obtained from the juice varies at different seasons (Squire, *op. cit.*)

	Juice.	
In January and February	4 to 5 lbs.	yield 1 lb. of extract.
In March	6 to 7 lbs.	
In April and May	8 to 9 lbs.	
In June, July, and August.........	6 to 7 lbs.	
In September and October	4 to 5 lbs.	
In November and December	4 lbs.	

It is obvious, then, that the expressed juice is richest in solid constituents in the months of November and December. It is remarkable, however, that the juice possesses the greatest bitterness in the summer months; while in the spring, and late in the autumn, it has a remarkably sweet taste (Geiger, *Handb. d. Pharm.*) Squire (*op. supra cit.*) considers this change to be effected by the frost.

Physiological Effects.—Its obvious effects are those of a stomachic and tonic. In large doses it acts as a mild aperient. Its diuretic operation is less obvious and constant. In various chronic diseases its continued use is attended with alterative and resolvent effects. But where the digestive organs are weak, and readily disordered, taraxacum is very apt to occasion dyspepsia, flatulency, pain, and diarrhœa.

Uses.—It is employed as a resolvent, aperient, and tonic, in chronic diseases of the digestive organs, especially hepatic affections; as jaundice, chronic inflammation, or enlargement of the liver, dropsy dependent on hepatic obstruction, and dyspepsia, attended with deficient biliary secretion. In some very susceptible conditions of the stomach, it proves injurious. It has been employed in affections of the spleen, chronic cutaneous diseases, uterine obstructions, &c.

Administration.—It is employed in the form of either *decoction* or *extract*.

1. *Decoctum Taraxaci*, E. D. (Taraxacum, herb and root, fresh, ℥vij. [℥iv. *D.*]; Water, Oij. [wine measure, *D.*] Boil together down to a pint, and strain).—Aperient and tonic. Dose, f℥j. to f℥ij. To increase its aperient property, a saline purgative may be conjoined.

2. *Extractum Taraxaci*, L. E. D. (Fresh root of Taraxacum, bruised, lb. ijss. [lb. j. *E.*]; Boiling Distilled Water, *Cong.* ij. [*Cong.* j. *E.*] Macerate for twenty-four hours, then boil down to a gallon, and strain the liquor while hot; lastly, evaporate to a proper consistence, *L.* —"Proceed as for the preparation of extract of poppyheads," *E.*—The *Dublin College* employed both herb and root).—Extract of taraxacum should be brown, not blackish: its taste is bitter and aromatic: that of the shops is usually more or less sweet. It should be completely soluble in water. Dose, grs. x. to ʒss.

Lactu'ca sati'va, Linn. L. E. D.—*The Garden Lettuce.*

Sex. Syst. Syngenesia, Polygamia æqualis.

(Succus spissatus, *L.*—Inspissated juice of *L. virosa* and *L. sativa*, *E.*—Herba, *D.*)

History.—The θρίδαξ, or *Lettuce*, was well known to the ancient Greeks and Romans. It is mentioned by Hippocrates (*De diæta*, ii. p. 359; and *De Morb. Mul.* i. 629 and 635) both as an aliment and medicine. "The sedative powers of *Lactuca sativa*, or Lettuce, were known," observes Dr. Paris (*Pharmacol.* vol. i. p. 13, 6th ed.) in "the earliest times; among the fables of antiquity, we read that, after the death of Adonis, Venus threw herself on a bed of lettuces, to lull her grief, and repress her desires."

BOTANY. *GEN. CHAR.*—*Heads* many- or few-flowered. *Involucre* cylindrical, calyculate-imbricate, in two to four rows; outer rows short. *Receptacle* naked. *Achene* plane, obcompressed, wingless, abruptly terminating in a filiform beak (D. C.)

SP. CHAR.—*Leaves* not concave, erect, oblong, narrowed at the base, smooth at the keel. *Stem* elongated, leafy (D. C.)

Annual. *Stem* erect, simple below, branched above, one or two feet high, smooth. *Leaves* rounded or ovate, semi-amplexicaul, frequently wrinkled, usually pale-green; varying much in the different varieties. *Flowers* yellow.

Mr. Loudon (*Encycl. of Garden.* p. 856) enumerates no less than fourteen varieties cultivated by gardeners for the table. Seven of these are *Cabbage Lettuces* (*Lactuca capitata*), and the others are *Cos Lettuces* (*Lactuca romana*).

HAB.—Native country unknown: perhaps the East Indies. Extensively cultivated in Europe.

PREPARATION OF LACTUCARIUM.—Before the flower-stem shoots up, the plant abounds with a cooling, bland, pellucid juice; afterwards it contains an intensely bitter, milky juice, which resides in the root, cortical portion of the stem and of the branches, and in the involucrum. When incisions are made in the flowering-stem this milky juice exudes. When collected and dried it constitutes *lactucarium* or *lettuce opium.* It is (or was) prepared on a large scale by Mr. Young of Edinburgh (Duncan, *Edinb. Dispens.* p. 384, 11th ed.; *Mem. of the Caled. Hortic. Soc.* vol. i. p. 160).

PROPERTIES.—*Lettuce opium* (*Thridace* seu *Lactucarium*), as found in commerce, occurs in roundish hard masses, of a brown colour, with an opiate smell and a bitter taste.

The term *lactucarium* has been applied indiscriminately to various and different preparations of the lettuce; viz. to the substance above described, to the inspissated expressed juice, and to extracts (watery and alcoholic) obtained from the lettuce (see Duncan's *Edinb. Disp.*) But the only preparation I am practically acquainted with, and which I have found in commerce, is the one described in the text.

COMPOSITION.—Lactucarium has been analyzed by Klink (Pfaff, *Syst. d. Mat. Med.* vi. 504), by Schrader (Gmelin, *Handb. d. Chem.* ii. 1286), by Peschier (Dulk, *Preuss. Pharm. übers.* i. 625), by Peretti (*Pharm. Central-Blatt. für* 1831, S. 467), and by Buchner (*Ibid. für* 1833, S. 27).

Klink's Analysis.	
Bitter extractive	55·0
Wax	10·0
Resin	6·9
Caoutchouc	17·5
Water	15·6
Lactucarium	105·0

Buchner's Analysis.	
Odorous matter	undetermined
Lactucin, with colouring matter	18·6
Gummy extractive	14·666
Soft resin, with waxy matter	12·467
Waxy matter (myricin)	35·100
Gluten or albumen	19·100
Air-dried Lactucarium	99·933

1. *Odorous matter.*—The nature of this substance has not been determined: it is probably similar to that of the odorous principle of opium. When lactucarium is submitted to distillation with water, the odorous principle passes over with the latter.

2. *Bitter principle; Lactucin.*—A saffron-yellow, almost odourless, very bitter, combustible substance. It is very slightly soluble in cold water, readily soluble in alcohol, less so in ether. Infusion of nutgalls renders a solution of it, in very dilute spirit, turbid.

3. *Empyreumatic Oil of Lettuce.*—Dr. Morries (*Ed. Med. and Surg. Journ.* vol. xxxix.) says, the empyreumatic oil of lettuce differs from that of opium only in being more fusible.

A strong though unfounded suspicion appears to have been entertained, that *morphia* was contained in lactucarium. But in none of the before-quoted analyses was it found; neither was Caventou (*Journ. de Chim. Méd.* i. 300) able to detect an atom of either morphia or narcotin in lactucarium.

CHARACTERISTICS.—The cold aqueous decoction of lactucarium becomes, on the addition of sesquichloride of iron, olive brown (*tannate? of iron*). Tincture of nutgalls renders the decoction slightly turbid. Heated with lactucarium, colourless nitric acid acquires an orange-yellow tint, and evolves binoxide of nitrogen. The alcoholic tincture of lactucarium becomes slightly turbid on the addition of water.

PHYSIOLOGICAL EFFECTS.—*Lettuce leaves*, eaten as a salad, are easily digested, but they yield only a small portion of nutritive matter. They probably possess, in a very mild degree, soporific properties. The ancients considered them anti-aphrodisiac.

Lactucarium possesses anodyne and sedative qualities; but its powers have, I suspect, been over-rated. Ganzel (Sundelin, *Handb. d. Sp. Heilm.* Bd. i. S. 459, 3tte Aufl.) states, that ten grains introduced into the cellular tissue of a dog's leg, caused deep sopor, with occasional convulsions, but no dilatation of the pupil. François (*Arch. Gén. de Méd.* Juin 1825, p. 264), who made a considerable number of trials of it, observes that it contains neither a narcotic nor an intoxicating principle; but that it allays pain, diminishes the rapidity of the circulation, and, in consequence, reduces the animal heat, and places the patient in a condition more favourable to sleep. Its *modus operandi* is different from that of opium; for the latter substance accelerates the pulse, and produces either delirium or stupor. It is more allied to hyoscyamus, from which, according to Fisher (*Lond. Med. Gaz.* xxv. 863), it is distinguished by its power of directly diminishing sensibility; whereas hyoscyamus produces this effect indirectly, being preceded by irritation of the nervous system. A more extended experience of the use of lactucarium, however, is requisite to enable us to form accurate conclusions as to the precise nature and degree of its powers.

USES.—*Lettuce leaves* are employed at the table as a *salad*. As they appear to possess slight hypnotic properties, they may be taken with advantage at supper, to promote sleep. Galen (*De aliment. facult.* lib. ii. cap. 40), who in his old age was troubled with watchfulness, was relieved by the use of lettuce at night. On the other hand, prudence points out the propriety of abstaining from the use of this plant, if there be any tendency to apoplexy.

Lactucarium is employed as an anodyne, hypnotic, antispasmodic, and sedative, where opium is considered objectionable, either from peculiarities on the part of the patient or from the nature of the disease. Thus it may be used where there is morbid excitement of the vascular system, in which condition opium is usually contra-indicated. But though it is free from several of the inconveniences which attend the use of opium, yet it is much less certain in its operation. It may be given with advantage to allay cough in phthisis and other pulmonary affections (Duncan, *Observ. on Pulm. Consump.* 1813); to relieve nervous irritation and watchfulness in febrile disorders in which opium is not admissible. Dr. Rothamel (Dierbach, *Neuest. Entd. in d. Mat. Med.* S. 118, 1837) has employed it with success in different kinds of fevers, inflammations, exanthemata, profluviæ, cachexies, and painful and peculiar nervous disorders. Vering (*Ibid.* S. 119) found it especially useful in spasm of the uterus; and Angelot gave it to repress seminal discharges.

ADMINISTRATION.—The usual dose is from grs. iij. to grs. v.; but it has been given in very much larger quantities. According to Trousseau and Pidoux (*Traité de Thérap.* i. 260), four drachms have been taken during the day.

Lactu'ca viro'sa, Linn. E. D.—*Strong-scented Lettuce.*

Sex. Syst. Syngenesia, Polygamia æqualis.

(The Inspissated Juice, *E.*—Folia, *D.*)

HISTORY.—According to Sprengel (*Hist. Rei Herb.* i. 185), this is the *θρίδαξ ἀγρία* of Dioscorides (ii. 166); but Dr. Sibthorp (*Prodr. Fl. Græcæ*, ii. 126) suggests that *Lactuca Scariola* was the plant referred to by Dioscorides.

BOTANY. *GEN. CHAR.*—See *Lactuca sativa.*

SP. CHAR.—*Stem* erect, round; the base smooth or prickle-bristle-pointed; the apex panicled. *Leaves* horizontal, prickle-bristle-pointed at the keel, acutely denticulate, obtuse, at the base arrow-shaped; the lower ones sinuate. *Achenes* striated, nearly shorter than the beak (D. C.)

Herb abounding in fetid milky juice. *Root* tap-shaped. *Stem* two to four feet high. *Leaves* distant. *Florets* yellow.

HAB.—Indigenous; about hedges, old walls, and borders of fields; not uncommon. Biennial. Flowers in August and September.

COMPOSITION.—The *milky juice* of this plant was analyzed by Klink (Pfaff, *Mat. Med.* vi. 509), who found in it *resin* 7·5, *wax* 8·75, *caoutchouc* 22·5, *matters soluble in water* (*bitter principle, gum, albumen, lactucic acid, lactucates of lime and magnesia, and nitrate of potash*) 51·25, *water* 10. Buchner (*Pharm. Centr.-Blatt. für* 1833, S. 29) examined the *lactucarium* obtained from this plant.

The *lactucic acid* has considerable resemblance to oxalic acid, from which it is distinguished by its producing, with ammonia and a solution of chloride of iron, a green precipitate; with sulphate of copper, a brown one; and with magnesia a difficultly soluble salt.

The *odorous* and *bitter principles* are similar to those of Lactuca sativa (see p. 965-6).

PHYSIOLOGICAL EFFECTS.—The experiments of Orfila (*Toxicol. Gén.*) on dogs, shew that this plant possesses narcotic qualities; but its powers are not very great. A solution of the extract thrown into the veins, caused heaviness of head, slight drowsiness, feebleness of the hind extremities, difficult and frequent respiration, slight convulsive movements, and death. Glaser (Wibmer, *Wirk. d. Arzn. u. Gifte*, Bd. iii. S. 200) considers it to possess acrid properties. On Wibmer, two grains of the extract caused sleepiness and headache.

USES AND ADMINISTRATION.—See *Lactucarium* (p. 966).

Other useful Cichoraceæ.

Cicho'rium In'tybus; Wild Succory, Chicory, or *Wild Endive.*—An indigenous plant known to Theophrastus, Dioscorides, and Pliny. It is extensively cultivated in Belgium, Holland, and Germany. The blanched leaves are sometimes employed at the table as a substitute for endive (*Cicho'rium Endiv'ia*). The constituents of the leaves are *extractive, chlorophylle, sugar, albumen, woody fibre*, and *salts* (as nitre). The root (*radix cichorii*) is fleshy and spindle-shaped, like the carrot. It has an analogous composition to the leaves. Waltl says it contains *inulin* (see p. 951). An infusion of the root, mixed with syrup, becomes thick; forming the *gomme saccho-chicorine* of Lacarterie. The root, when cut, dried, roasted (*roasted chicory; radix cichorii torrefacta*), and ground (*chicory-coffee*), is used as a substitute for, or to adulterate, coffee. (For the mode of preparation, see *Ann. de Chim.* lix. 307.) To detect the adulteration, shake the suspected coffee with cold water in a wine-glass: if it be pure coffee it will swim, and scarcely colour the fluid; but the chicory sinks, and communicates a deep red tint to the water. Chicory-coffee yields a perfectly wholesome beverage, but which wants the fine flavour for which genuine coffee is so renowned. The medicinal properties of Cichorium Intybus are analogous to those of Taraxacum Dens-leonis. The fresh root is tonic, and, in large doses, aperient. It has been used in chronic, visceral, and cutaneous diseases, usually in the form of decoction.

FIG. 189.

Cichorium Intybus.

ORDER 48. VALERIANA'CEÆ, *Lindley.*—THE VALERIAN TRIBE.

VALERIANEÆ, *Decandolle.*

ESSENTIAL CHARACTER.—Tube of the *calyx* adnate to the ovary; the limb various, either dentate or partite, or changed into a pappus, which is at first involute, afterwards expanded. *Corolla* tubular, funnel-shaped; usually five-lobed, rarely three- or four-lobed; lobes obtuse; tube equal or gibbous, or calcarate at the base. *Stamens* adnate by their *filaments* to the tube of the corolla; free at the apex; alternate with the lobes of the corolla; five (the type), four, three, two, or solitary: *anthers* ovate, bilocular. *Style* filiform; *stigmas* two or three, free or cohering. *Fruit* membranous or somewhat nucamentaceous, indehiscent, crowned, at least when young, with the limb of the calyx, either three-celled (two cells being empty) or one-celled. *Seeds*, in the fertile cell or fruit, solitary, pendulous, exalbuminous; *embryo* erect, with a superior radicle and two flat cotyledons (D. C.)—Annual or perennial *herbs*, rarely at the base somewhat shrubby. *Roots* of the perennial species odorous. *Leaves* opposite, without stipules. *Flowers* cymose-corymbose.

PROPERTIES.—The roots of the perennial species are highly odorous. They possess nervine and antispasmodic properties, and have been used in epilepsy (see *Valeriana officinalis*). Their odour is for the most part disagreeable.

Valeria'na officina'lis, Linn. E. D.—*Great Wild Valerian.*

Valeria'na officina'lis (sylves'tris), *L.*

Sex. Syst. Triandria, Monogynia.

(Radix, *L. D.*—Root, *E.*)

HISTORY.—The earliest writer who notices this plant is Fuchsius. The φοῦ of Dioscorides (lib. i. cap. x.) is not the Valeriana sylvestris, as Hoffman supposed, but the *V. Dioscoridis* (Smith, *Fl. Græcæ*, Sibth. t. 33).

BOTANY. *GEN. CHAR.*—Limb of the *calyx* involute during flowering, then unrolled into a deciduous pappus, consisting of many plumose setæ. Tube of the *corolla* obconical or cylindrical, equal at the base or gibbous, without a spur; limb obtusely five-cleft, rarely three-cleft. *Stamens* three. *Fruit* indehiscent; when ripe one-celled, one-seeded (D. C).

Sp. Char.—Smoothish, erect. *Stem* furrowed. *Leaves*, all, or nearly so, pinnatised; the segments, seven or eight pairs, lanceolate, serrate. *Corymbus* at length, somewhat panicled. *Fruit* smooth (D. C.)

Root tuberous. *Stem* from two to four feet high. *Leaflets* coarsely serrated, those of the radical leaves broadest, approaching to ovate; but there is no remarkably large terminal leaflet. *Corolla* roseate or white.

Several varieties of this species are described. Dufresne mentions four:—

α. *V. excelsa.*—The largest kind; above six feet high.

β. *V. latifolia seu media.*—The commonest kind; usually from two to four feet high. Both grow in marshy places.

γ. *V. tenuifolia.*—Of this there appears to be two sub-varieties:—

αα. *V. officinalis* (*sylvestris*), Ph. L. *V. officinalis* α folii angustioribus, Woodville. *V. sylvestris major montana*, Bauhin.—In this sub-variety the *root* is more odorous, and is, therefore, preferred for medical use. The *stem* does not exceed two feet in height. The caulinar leaves are very narrow, and often entire.

ββ. *V. pratensis.*—Grows in marshy places at Heidelberg, near the Rhine.

δ. *V. lucida.*—Cultivated in botanical gardens, at Paris.

Description.—The root (*radix valerianæ minoris* seu *sylvestris*) consists of a short, tuberculated rhizome, from which issue numerous, round, tapering, root-fibres, which are from two to six inches long, white internally, and, when fresh, grayish or yellowish-white externally, but when dried yellowish-brown. They give origin to other smaller fibres: their odour, both fresh and dry, is strong, very characteristic, and highly attractive to cats; their taste is warm, camphoraceous, slightly bitter, somewhat acrid, and nauseous. Hill (*Mat. Med.*) says the heaths of Kent and Essex furnish a great deal of it. Loudon (*Encycl. Agricult.* pp. 945 and 1152) says it is cultivated for medicinal use at Ashover, in Derbyshire. The roots are dug up in the autumn, when the leaves are decayed.

Composition.—According to Trommsdorf (Geiger, *Handb. d. Pharm.* ii. 394), 100 parts of dry valerian root consist of *volatile oil* 1·2, *peculiar resinous extractive* 12·5, *gummy extractive* 9·4, *soft resin* 6·2, *woody fibre* 70·7.

1. *Volatile Oil of Valerian.*—When valerian root is submitted to distillation with water, the distilled products are *water* and *oil*, both of which contain *valerianic acid.* If the acid oil be mixed with carbonate of magnesia, and distilled, the pure oil passes over, and valerianate of magnesia is left in the retort. The pure oil is pale green, or yellowish and limpid; it has a penetrating camphoraceous odour, and an aromatic, bitter, camphoraceous, but not acrid taste. Its sp. gr. is 0·934. According to Bonastre, nitric acid makes it blue, and converts it ultimately into oxalic acid.

2. *Valerianic Acid.*—A volatile fatty acid, obtained by adding sulphuric acid to valerianate of magnesia, and distilling. As thus obtained, the acid is in the state of hydrate; but by careful distillation it may be deprived of water. When pure, it is a colourless, limpid, oleaginous liquid. Its odour has considerable analogy with that of the oil; from which, as well as from other circumstances, it is suspected to be formed by the oxidation of the oil. It is liquid at —6° F., boils at 270°, is soluble in 30 parts of water, and in all proportions in alcohol and ether. The anhydrous acid consists, according to Ettling, of C^{10}, H^9, O^3: its atomic weight, therefore, is 93. All the neutral *valerianates* are soluble.

3. *Resin.*—Is black, has an acrid taste, and an odour of leather. It is soluble in alcohol, ether, and oils, but not in a solution of soda.

4. *Resinous Extractive.*—Is soluble in water, but is insoluble in ether and absolute alcohol. It is precipitated from its solution by almost all the metallic solutions.

Physiological Effects.—Valerian excites the cerebro-spinal system: hence it may be denominated a *cerebro-spinal stimulant* (see p. 67 and 76). Large doses cause headache, mental excitement, visual illusions (scintillation, flashes of light, &c.), giddiness, restlessness, agitation, and even spasmodic movements. Barbier (*Mat. Méd.* ii. 83, 2nde éd.) says that a patient in the Hôtel-Dieu d'Amiens, who took six drachms of the root daily, in the form of decoction, awoke up suddenly out of his sleep, and fancied he saw one side of the room on fire. Its operation on the nervous system is also evinced by its occasional therapeutic influence over certain morbid states of this system; whence it has been denominated *nervine* (*nervino-alterative*), *tonic* and *antispasmodic*. Furthermore, it intoxicates cats (who are very fond of it). Under its influence these animals roll themselves on the ground in "outrageous playfulness," and are violently agitated. However, the before-mentioned effects of valerian on the nervous system of man are by no means constant; whence practitioners have lost confidence in it as a remedial agent. "Yet I have met with some," observes Dr. Heberden (*Comment.* ch. 69), "whom it threw into such agitations and hurries of spirits, as plainly shewed that it is by no means inert." More inconstant still are its effects on the functions of organic life. For while in some cases it has accelerated the pulse, augmented the heat of the body, and promoted the secretions (see Carminati, *Opusc. Ther.* i. 238; Jörg, *Journ. de Chim. Méd.* vii. 275-6), in others it has failed to produce these effects (Trousseau and Pidoux, *Traité de Thérap.* i. 1 and 2). Large doses often create nausea.

Uses.—Valerian may be employed as a nervous excitant, and, where stimulants are admissible, as an antispasmodic. Though formerly in repute, it is now but little used. It has been principally celebrated in *epilepsy*. It came into use in modern times through the recommendation of Fabius Columna, who reported himself cured by it, though it appears he suffered a relapse (Murray, *App. Med.* i. 275). Its employment has found numerous advocates and opponents (see Copland's *Dict. Med.* ii. 808); but at the present time most practitioners regard it as a medicine of very little power. In the few cases in which I have employed it, it has failed to give the least relief. In some of the milder and more recent forms of the disease, neither dependent on any lesion within the cranium, nor accompanied with plethora, it may occasionally prove serviceable. In *chorea*, and other spasmodic affections, it has been used with variable success. I have found temporary benefit from its use in females affected with *hypochondriasis* and *hysteria*. Of its use as a nervous stimulant in the low forms of *fever* we have been little experienced in this country. In Germany, where it is more esteemed, its employment in these cases is spoken highly of (Richter, *Ausf. Arzneimittell.* iii. 23; Sundelin, *Heilmittell.* ii. 126).

Administration.—The dose of the *powder* is from ℈j. to ʒj., or even ʒij. Though objected to by some, on account of the quantity of inert woody fibre which it contains, it is, when well and recently prepared, an efficacious form for administration.

1. *Infusum Valerianæ*, D.—(Valerian, in coarse powder, ʒij.; Boiling Water, f℥vij. Digest for an hour, and strain the liquor when cold). Dose, f℥j. or ℥ij. This preparation is somewhat less apt to disturb the stomach than the powder.

2. *Tinctura Valerianæ*, L. E. D.—(Valerian, bruised [in powder, *D.*], ℥v.; Proof Spirit, Oij. Macerate for fourteen [seven, *D.*] days, and strain, *L.* "Proceed by percolation or digestion, as for tincture of cin-

chona," *E.* The relative proportions of root and spirit used by the *Dublin College* are the same as those of the other Colleges.) Dose, f℥j. to f℥iv.—Though this preparation possesses the virtues of valerian, it is scarcely sufficiently strong to produce the full effects of the root, without giving it in doses so large as to be objectionable, on account of the spirit contained therein.

3. *TINCTURA VALERIANÆ COMPOSITA*, L.; *Tinctura Valerianæ ammoniata*, E. D.—(Valerian, bruised, ℥v.; Aromatic Spirit of Ammonia, Oij. Macerate for fourteen [seven, *D.*] days, and strain, *L.*—" Proceed by percolation or by digestion in a well-closed vessel, as directed for tincture of cinchona," *E.*—The relative proportions of valerian and spirit of ammonia used by the Dublin College are the same as those of the other Colleges). Dose, f℥j. to f℥ij. The stimulant influence of the valerian is greatly increased, and its therapeutical efficacy oftentimes augmented, by the ammonia in this preparation.

Other Medicinal Valerianaceæ.

The root of *Nardostac'hys Jataman'si*, D.C. (*Valeriana Jatamansi*, Roxburgh) appears from the proofs adduced by Sir W. Jones (*Asiat. Research.* ii. 405, and iv. 109) and Dr. Royle (*Illustr.* 242), to be the *Spikenard* (Νάρδος Ἰνδική, Dioscorides, lib. i. cap. 6) of the ancients. It is highly esteemed at the present day throughout the East, both as a perfume and as a stimulant medicine. The *root* is long, hairy, and tap-shaped. *Stems* perennial, very short. *Branches* erect, a few inches high. *Leaves* obovate-lanceolate. *Flowers* pale pink, clustered in the axils of the upper leaves. The plant is a native of the mountains of the North of India.

FIG. 190.

Nardostachys Jatamansi.

Valeria'na Dioscor'idis, Fl. Græc. is the Φοῦ of Dioscorides, and is the strongest of the Valerians. It is a native of Lycia.

ORDER 49. RUBIA'CEÆ, *Jussieu.*—THE CINCHONA TRIBE.

CINCHONACEÆ, LYGODYSODEACEÆ, and STELLATÆ or GALIACEÆ, *Lindley.*

ESSENTIAL CHARACTER.—Tube of the *calyx* adherent to the ovary; limb various, truncated or many-lobed, frequently regular; the lobes as many as those of the corolla, rarely intermixed with accessory teeth. *Corolla* gamopetalous, inserted into the top of the tube of the calyx; lobes usually four to five, rarely three to eight; contorted or valvate in æstivation. *Stamens* as many as, and alternate with, the lobes of the corolla; more or less adnate to the tube of the corolla; *anthers* oval, bilocular, turned inwards. *Ovarium* within the calyx to which it coheres, usually two- or many- celled, rarely by abortion one-celled, crowned with a fleshy urceolus, from which a single *style* arises. *Stigmas* usually two, distinct, or more or less coherent, rarely many, distinct, or coherent. *Fruit* baccate, capsular, or drupaceous, two- or many-celled; the cells one- two- or many-seeded. *Seeds* in the one-seeded cells attached at the apex, or usually at the base; in the many-seeded ones, connected with a central placenta, usually horizontal: *albumen* horny or fleshy, large: *embryo* straight or somewhat curved, in the midst of albumen; the *radicle* terete, turned to the hilum; the *cotyledons* foliaceous (D. C.)—*Trees, shrubs,* or *herbs. Leaves* simple, quite entire, opposite, or rarely verticillate, with stipules. *Flowers* arranged variously, rarely unisexual by abortion.

PROPERTIES.—The *roots* often abound in colouring matter, and hence are used in dyeing; as some of those belonging to the genera *Ru'bia*, *Garde'nia*, *Hedyotis*, *Genipa*, *Ga'lium*, *Asper'ula*, *Palicourea*, *Oldenlan'dia*, &c. Many roots possess emetic properties, as those of *Cephae'lis*, *Psycho'tria*, *Richardso'nia*, *Spermaco'ce*, *Manet'tia*, *Chiococ'ca*, &c.

The *barks* are often bitter, astringent, and somewhat aromatic; and are eminently distinguished for their tonic, febrifuge, and antiperiodic qualities, as those of *Cincho'na*, *Exoste'ma*, *Couta'rea*, *Cosmibuena*, *Remija*, *Hymenodic'tyon*, *Pinkne'ya*, &c.

The important use of the torrefied *albumen* of *Coffe'a arab'ica* is well known. It is probable that the albumen of other species possesses analogous properties: that of *Psycho'tria herba'cea* has been used for similar purposes.

Cincho'na, Decandolle.—*Several species yielding Peruvian Bark.*

C. Cordifo'lia, lancifo'lia, and oblongifo'lia, *L. D.*—C. Condamin'ea, micran'tha, and other undetermined species, *E.*

Sex. Syst. Pentandria, Monogynia.

(Cortex, *L. D.*—Bark, *E.*)

HISTORY.—The precise period and manner of the discovery of the therapeutic power of cinchona is enveloped in mystery. It is even doubtful whether the Indians knew it previous to the Spaniards. Geoffroy (*Mat. Méd.* ii. 181) says, that the Indians were acquainted with this medicine long prior to the arrival of Columbus; but from the implacable hatred which they conceived against the Spaniards, they kept it secret for many years, until, in fact, an Indian, grateful for some favours received from the Governor of Loxa, imparted to him the secret of this valuable specific. Humboldt (Lambert's *Illustr.* p. 22) however, disbelieves these statements; for, in Loxa, and other parts far around, he found the natives ranked Cinchona among poisons, and were totally unacquainted with its uses. "In Malacatis only," says he, "where many bark-peelers live, they begin to put confidence in the Cinchona bark." Ulloa (*Voy. de l'Amér.-mérid.* i. 271) also asserted, that the Peruvians were ignorant of the medical uses of cinchona. The traditions, therefore, of the supposed discovery of the remedy by an Indian being cured of an ague by drinking at a pool into which some Cinchona trees had fallen (Geoffroy, *Introd. ad Mat. Méd.* p. 48), as well as the more improbable story told by Condamine (*Mém. Acad. Sc. de Paris*, 1738, p. 226), of the Indians observing lions ill with ague eating Cinchona bark, must be fabulous. The assertion, says Humboldt, that the great American lion (*Felis concolor*) was subject to fever, is as bold as that made by the inhabitants of the pestilential valley, Gualla Bamba, near Quito, that even the vultures (*Vultur aura*) in their neighbourhood were subject to that disorder. Moreover, in the Cinchona forests, lions are not found, though the puma (*Felis andicola* of Humboldt, the *petit lion du Volcan de Pichincha* of Condamine) has been met 2,500 toises (15,000 feet) above the level of the sea.

Humboldt (*op. cit.* p. 23) tells us of an old tradition, current in Loxa, that the Jesuits having accidentally discovered the bitterness of the bark, tried an infusion in tertian ague, and in this way became acquainted with its valuable properties. This he thinks a much less improbable tradition than that which ascribes the discovery to the Indians. The period when bark was first introduced into Europe is usually stated to be 1640; but Sebastian Badus (quoted by Bergen, *Monogr.* 84) gives an extract from a letter of a Spanish physician, D. Joseph Villerobel, from which it appears that it was imported into Spain in 1632, though no trial was made of it until 1639.

The statement of Condamine (*op. cit.*), that the Countess of Chinchon, wife of the Viceroy of Peru, brought some bark to Europe on her return from South America, in 1639, is not improbable: and from this circumstance it acquired the names of the *Cinchona Bark* and the *Countess's Powder* (*Pulvis Comitissæ*). About ten years after it was brought by the Jesuits to Rome, and by them distributed among the members of the order, who carried it to their respective stations, and used it with great success in agues. Among those most active in promoting its employment was Cardinal de Lugo. In this way it acquired the names of *Jesuit's Bark*, *Pulvis Patrum*, *Jesuit's Powder* (*Pulvis Jesuiticus*), *Pulvis Cardinalis de Lugo*, &c. (Geoffroy, *Mat. Med.*) It fell, however, into disuse, but was again brought into vogue, in France, by Sir Robert Talbor, who acquired great reputation for the cure of intermittents by a secret remedy. Louis XIV. purchased his secret (which proved to be Cinchona), and made it public (Talbor, *English Remedy*, 1682). Hence it became known in France as *Talbor's powder*, or the *English Remedy*.

BOTANY. *GEN. CHAR.*—*Calyx* five-toothed. *Corolla* hypocrateriform, with a five-parted limb, valvate in æstivation. *Anthers* linear, inserted within the tube, and not projecting, unless in a very slight degree. *Capsule* splitting through the dissepiment into two *cocci* open at the commissure, and crowned by the calyx. *Seeds* girted by a membranous lacerated wing (Lindley).—*Trees* or *shrubs*, with an aromatic, bitter, astringent, eminently febrifuge bark. *Leaves* shortly petioled with plane margins. *Stipules* ovate or oblong, foliaceous, free, deciduous. *Flowers* paniculate-corymbose, terminal, white or roseate-purplish.

SPECIES.—Dr. Lindley mentions twenty-six species; of which twenty-one are well known.

§ 1. *Limb of the corolla stupose. Leaves scrobiculate.*

1. C. MICRAN'THA, *Fl. Peruv.* ii. 52, t. 194; *Ruiz and Pav. Quinol. suppl.* p. 1. D.C. *Prodr.* iv. 354. C. scrobiculata, *Humb. and Bonpl. Pl. æquin.* i. p. 165, t. 47; D.C. *Prodr.* iv. 352.—High, cool, and wooded mountains of Peru, near Chicoplaya, Monzon, the Pueblo de San Antonio de Playa grande, *R. and P.*; forests in the province of St. Jaen de Bracamorros, *H. and B.* The last travellers were told that it also occurs at Chirinas Tabaconas, St. Ignacio, and Tambovapa. Cuchero, *Pöppig.*

This species yields *Silver* or *Gray Cinchona*. From the young branches is obtained the *Pata de Gallinazo* (Pöppig). Humboldt and Bonpland, as well as Ruiz and Pavon, declare that from C. scrobiculata (which Dr. Lindley says is identical with C. micrantha) is obtained *Cascarilla fina.*

2. C. NIT'IDA, *Fl. Peruv.* ii. 50, t. 191. Cascarillo officinal, *Ruiz Quinol.* p. 56.—Lofty mountains of the Andes, in groves, in cold situations near Pampamarca, Chacahuassi, Casapi, Casapillo, Cayumba, Sapan, Cuchero, and other districts; also on mountains in the provinces of Huamalies, Tarma, and Xauxa, *R. and P.?* Cuchero, *Pöppig.*

According to Ruiz, this species, like the last, yields *Cascarillo* or *Quino fino.*

3. C. CONDAMIN'EA, *Humb. and Bonpl. Pl. æq.* i. 33, t. 10. Quinaquina, *Condam.* in *Act. Par.* 1738.—Near Loxa, in the mountains of Cajanuma-Uritucinga, and in those of Boqueron, Villonaco, and Monje; it is also found near Guancabamba and Ayavaca, in Peru. It always grows on micaceous schist, and rises as high as 7,500 feet above the level of the sea, first appearing at the elevation of 5,700 feet; so that it occupies a zone of 1,800 feet, *Humboldt.*

This species yields *Cascarilla fina de Uritusinga*, our *Crown* or *Loxa Bark.*

§ 2. *Limb of the corolla not stupose. Leaves not scrobiculate.*

4. C. LANCIFO'LIA or Quina naranjada, *Mutis. period. de St. Fé.* C. angustifolia, *Pav. Quinol. suppl.* xiv. f. *a.* C. Tunita, *Lopez MSS.*—Woods in the kingdom of Santa Fé, *Quinol. suppl.*

Some years since a very inferior yellow bark, with a whitish epidermis, was imported into London, and was known to our dealers under the name of *New spurious Yellow Bark*. I sent a specimen of it to Professor Guibourt, who recognised it as the bark described by him as *Quinquina de Carthagène spongieux*. He has subsequently found it to be identical with the *Orange Cinchona* of Mutis, lodged in the Muséum d'Hist. Naturelle de Paris, by Humboldt.

Bergen found, in Ruiz's collection, a bark said to be the produce of C. lancifolia Mutis, and which agreed with the *False Loxa Bark*, Bergen.

5. C. LUCUMÆFO'LIA, *Pavon in herb. Lambert.* C. stupea, *Idem.*—Loxa, in Peru, *Pavon.*

The bark, perhaps, forms part of the *Quina fina de Loxa.*

6. C. LANCEOLA'TA, *Fl. Peruv.* ii. 51; iii. t. 223. Cascarillo lampino, *Ruiz, Quinol.* 64.—Cold, elevated, mountainous situations, in groves on the Andes, in the districts of Muña, Panas, Pillas, and Cuchero, *R. and P.* At the distance of fifteen or twenty leagues from the city of Huànuco, *Ruiz MSS.* Bolivia.

The bark of this species is called *Quina Anteada, Cascarilla Amarilla*, and *Casc. boba de Muna.* Ruiz suspects it to be *Calisaya* bark, i.e. *Yellow Bark* of English commerce.

7. C. OVALIFO'LIA, *Humboldt and Bonpl. pl.* i. æq. i. 65, t. 19. C. Humboldtiana, *R. and P.* v. 13, D. C. *Prodr.* iv. 353. Loxa, *Pavon.*—Forests in the province of Cuença, *Humb. and Bonpl.*

The bark of this species is not much esteemed.

8. C. OVA'TA, *Fl. Peruv.* ii. 52, t. 195. Cascarillo pallido, *Ruiz, Quinol.* 74.—Close, ill-ventilated groves in the hotter parts of the foot of the Andes, near Pozuzo and Panas, ten leagues from Huanuco, *R. and P.*

Ash Cinchona was found by Bergen to be identical with the bark of *C. ovata* contained in Ruiz's collection.

9. C. ROTUNDIFO'LIA, *Ruiz and Pavon MSS. in herb. Lambert. Lambert Illustr. Cinch.* p. 5.—Loxa, in Quito, *Pavon.*

Bark unknown.

10. C. CORDIFO'LIA *Mutis MSS. Humb. Berl. Mag. d. Naturf.* i. 117. *S. and C.* iii. t. 185.—Mountains of New Grenada, at an elevation of from 5000 to 8000 feet above the sea, *Humb.*

The bark of this species is the *Quina amarilla* or *Yellow Cinchona* of Mutis, which both Bergen and Guibourt have ascertained to be *Hard Carthagena Bark.* It must not be confounded with the *Yellow Bark* of English commerce, from which sulphate of quinia is prepared.

11. C. PUBES'CENS, *Vahl. in Act. Hafn.* i. 19, t. 2. *Lambert's Description*, 21, t. 2. C. purpurea, *Fl. Peruv.* ii. 52, t. 193. Cascarillo morado, *Ruiz, Quinol.* 67.—Groves on the lower parts of the Andes, where it is cool at night, in the districts of Chinchao, Pati, Muña Iscutunam, Casapi, Casapillo, and Chihuamacala, *R. and P.*; mountain ridges of Panatahuas, Loxa, Jaen, and other provinces; on low hills, *Ruiz MSS.* Cuchero, *Pöppig.* Santa Fé.

This species yields the *Cascarilla boba colorada* which Reichel ascertained to be the *Huamalies Bark* of European commerce.

12. C. HIRSU'TA, *Fl. Peruv.* ii. 51, t. 192. Cascarillo delgado, *Ruiz, Quinol.* 60.—Wooded mountains of the Andes, in high and cool places near Pillas and Acomayo, *R. and P.*, and various other stations in the province of Panatahuas, near Huanuco, 10° south of the line, *Ruiz.*

It yields a kind of *Cascarilla fina*, formerly employed in medicine, under the name of *Quina delgadilla*, or *delgada.* Dr. Lindley thinks it perhaps forms part of the pure *Yellow Bark* of the shops.

13. C. GLANDULIF'ERA, *Fl. Peruv.* iii. 1. t. 324 Cascarillo glanduloso, *Ruiz, Quinol. Suppl.* 5. C. Mutisii, β. *Lambert's Illustrations*, p. 29.—Woody mountains of Peru, near Chicoplaza, *R. and P.*—Mountains of Panatahuas and Huamalies, and those of Monzon and Chicoplaza, *Ruiz, MSS.* Cuchero, *Pöppig.*

Its bark, called *Cascarilla negrilla*, is said by Reichel to be equal to the finest kind of Loxa bark. It formerly came among the Lima barks.

14. C. VILLO'SA, *Pavon. MSS.* C. Humboldtiana, *Lamb. Illustration*, 7. — St. Jaen de Loxa, *Pavon.*

Nothing is known of the bark.

15. C. OBLONGIFO'LIA. *Lambert, Illustr.* p. 12; not of Mutis. — Jaen de Loxa, *Pavon.*

The bark is quite unknown. The London College, therefore, has no ground for referring Red Cinchona to it.

§. 3. *Limb of the corolla smooth, or only downy at the edge.*

16. C. ACUTIFO'LIA, *Fl. Peruv.* iii. l. 53, t. 225. Cascarillo de Loja aguda, *R. and P. Quinol. Suppl.* 8.—Low groves of the Peruvian Andes, in Chicoplaya, by the river Taso, *R. and P.* Mountains of the Andes, near Chicoplaya, Monzon, and other places in the provinces of Panatahuas and Huamalies, *Ruiz, MSS.*

The bark is of very bad quality for medicinal purposes.

17. C. MAGNIFO'LIA, *Fl. Peruv.* ii. 53. t. 196. Cascarillo amarillo, *Ruiz, Quinol.* 71. C. caduciflora, *Lamb. Illustr.* 11; not of *Bonpl.* C. oblongifolia, *Mutis, according to R. and P.*; not *of Lambert.*—Abundant on the mountains of Panatahuas, about Cuchero, Chincao, Chacahuassi, and Puzuzu, in the low land near torrents, in places fully exposed to the sun, and badly ventilated, *R. and P.* Cuchero, *Pöppig.*

The bark is, according to Ruiz, the *Quina roxa of Santa Fé*, the *Red Cinchona* of Mutis, which both Bergen and Guibourt have shown to be the *Cinchona nova* of European pharmacologists.

18. C. CADUCIFLO'RA, Bonpl. in pl. Æquinoct. i. 167.—C. magnifolia, *l. c.* 136, t. 39. —Near the town of Jaen de Bracamoros, *Humb. and Bonpl.*

No use is made of the bark.

19. C. STENOCA'RPA, *Lambert*, Illustr. 13.—Jaen, in the mountains of Loxa, *Pavon.*

Bark unknown.

20. C. MACROCA'RPA, Vahl. in Act. Hafn. i. p. 26, t. 3. Lambert, descript. 22, t. 3.—C. ovalifolia, *Mutis MSS. Humb. Berl. Mag.* l. c. p. 118.—Loxa, *Pavon.* Santa Fé, *Humboldt;* a supposed variety is said to grow about Santa Martha.

Bark unknown.

21. C. CA'VA, *Pavon. MSS. in herb. Lambert.*—C. Pavonii, *Lambert, illustr.* 8.—Quito, *Pavon.*

Bark unknown.

*** *Species imperfectly known.*

Dr. Lindley mentions,—22, *C. dichotoma* (which is said to yield one of the *Quinas finas*); 23, *C. macrocalyx;* 24, *C. crassifolia;* 25, *C. Pelalba;* and 26, *C. Muzonensis,* as species which are imperfectly known.

Von Martius (*Pharm. Central-Blatt. für* 1831, S. 181) has described three other species, viz. *C. Bergeniana*, *C. Lambertiana*, and *C. macrocnemia.*

HAB.—The Cinchona species inhabit the Andes from 11° N. lat. to 20° S. lat. at varying elevations. It is difficult to assign limits to these elevations, since the statements of Humboldt on this subject are not uniform. Thus the lowest true Cinchonas are variously stated, by himself and Kunth, to grow at an elevation of from 200 toises (1200 feet) to 359 toises (2154 feet); while the highest are said to grow from 1487 toises (8922 feet) to 1680 toises (10,080 feet). The temperature of the Cinchona districts necessarily varies with their altitude; perhaps the average is about 68° F.

BARK-PEELING.—The mode adopted by the *Cascarilloes*, or bark-peelers, of obtaining cinchona, varies somewhat in different districts.—"The Indians," says Mr. Stevenson, (*Narrat. of* 20 *Years' Residence in South America*, vol. ii. p. 66, 1825) "discover from the eminences where a cluster of the trees grow in the woods, for they are easily discernible by the rose-coloured tinge of their leaves, which appear at a distance like bunches of flowers amid the deep-green foliage of other trees. They then hunt for the spot, and, having found it out, cut down all the trees, and take the bark from the branches:" and he adds, "after the Indians have stripped off the bark, they carry it in bundles out of the wood, for the purpose of drying it." Pöppig (*Compan. to the Bot. Mag.* No. viii. p. 244) says that the stems are not peeled for three or four days after they are cut down; and that the bark when removed must be quickly dried, or its value is greatly deteriorated. This account of the method of collecting the barks is somewhat different to that given by Mr. Gray from the papers of the late Mr. Arrot (*Phil. Trans.* 1737-8, vol. xl. pp. 81—6), who says that the bark is cut from the trees as they stand. According to both Ruiz and Pöppig, the peelers commence their operation about May, when the dry season sets in.

Commerce.—Cinchona is imported in chests (which are sometimes covered with hides) or serons (packages formed of an ox-hide, sometimes lined by a coarse cloth). The duty is 1d. per lb. The quantities imported, and those retained for home consumption, in the years 1827, 1830, and 1831, were as follow (*Parl. Returns*):—

	1827.	1830.	1831.
Total imported	385,690 lbs.	556,290 lbs.	225,678 lbs.
Quantity retained for Home Consumption	179,315 lbs.	56,879 lbs.	112,773 lbs.

The quantities on which duty was paid during the last five years are as follow (*Trade List*):—

In 1835	143,187 lbs.	In 1838	108,502 lbs.
In 1836	116,184 lbs.	In 1839	50,548 lbs.
In 1837	141,071 lbs.		

Cinchona is imported from various ports of the Pacific coast of South America. Arica, Valparaiso, Lima, Callao, and Payta, are the most common places of shipment. In consequence of an apprehended danger that the trees yielding bark would be exterminated, the government of Bolivia has prohibited the cutting of bark in its territory for five years, commencing January 1st, 1838. This event had long been expected. In 1836 I observed (*Lond. Med. Gaz.* vol. xviii. p. 723) that, "when we take into consideration the immense consumption of Cinchona bark (Pelletier alone in one year consumed 2000 quintals, equal to 200,000 lbs. of yellow or Calisaya bark, in the manufacture of the sulphate of quinia); that the trees yielding it are confined to one part of the world; and that no care is taken of their preservation; it is not at all improbable that in a few years this valuable drug may totally disappear from commerce. Indeed, a report has been prevalent among the drug-dealers, that the *Cascarilloes*, or bark-collectors, had arrived at the limits of the forests containing the yellow or Calisaya bark, but whether this be true or false, I know not. I am acquainted with one dealer who has laid in a large stock, on the speculation of the truth of this report."

"If," says Mr. Stevenson, (*Narrative*, vol. ii. p. 66) "the government of America do not attend to the preservation of the quina, either by prohibiting the felling of the trees, or obliging the territorial magistrates to enforce cutters to guard them from destruction, before a sufficient population will allow of those tracts of woodland becoming personal property, this highly-esteemed production of the new world will be swept from the country."

Description. (*a.*) *General Description.*—Before describing the various kinds of cinchona met with in commerce, it will be necessary to offer a few remarks on the general characters of barks (more especially of Cinchona barks). These may be noticed under the following heads:

cryptogamia found on, *structure*, *quilling*, *colour*, *taste*, *odour*, and *fracture* of, cinchona barks.

CRYPTOGAMIA FOUND ON CINCHONA BARKS.—These, especially the Lichens, have been elaborately examined by Fée (*Essai sur les Cryptog.* 1824) and by Zenker (Goebel and Kunze, *Pharm. Waarenk.* S. 109).

α. *Musci*, or *Mosses*.—We frequently find mosses on Cinchona barks; but as they are never met with in fructification, it is almost impossible to determine the genus to which they belong. They are probably species of Hypnum.

β. *Lichenes*.—These are found in great abundance, especially on *Loxa* or *Crown bark*. We may conveniently arrange them, according to Zenker, in four sections:—Sect. 1. *Coniolichenes*, or the pulverent lichenes (*Lichenes pulveracei*).—In this section we have the *Hypochnus rubrocinctus* (classed among the Fungi by Fée). I have frequently found it on the finest specimens of quilled yellow bark. Sect. 2. *Cryolichenes*, or the crustaceous lichenes (*Lichenes crustacei*).—These frequently put on very beautiful forms, and so colour the surface of the epidermis, that they appear to constitute a part of this coat. In that kind of pale bark usually called *gray*, or *silver*, the surface of the epidermis has a whitish cretaceous appearance, from the presence of various species of Arthonia and Pyrenula. Sect. 3. *Phyllolichenes*, or the foliaceous lichens (*Lichenes foliacei*).—These are found most abundantly on the *Crown* or *Loxa bark*. The most common species belong to the genera Parmelia, Sticta, and Collema. The P. coronata is a beautiful species, and one frequently met with. So also the Sticta aurata, remarkable for its yellow colour. Sect. 4. *Dendrolichenes*, or the filamentous lichenes (*Lichenes fruticosi*).—The Usneas are good examples of this section: they are found in abundance on the Crown bark. Two species are met with—U. florida, and U. barbata; a variety of the latter is curiously articulated.

γ. *Hepaticæ*.—Jungermannias are found on Cinchona barks, but in too broken a condition to determine their species. Fée, however, examined Humboldt's Herbarium, and found four.

δ. *Fungi*.—As Fungi usually grow on weakly or dead trees, their presence on Cinchona bark is a bad characteristic. Very few, however, are met with.

STRUCTURE.—Those barks known to druggists by the name of *coated* barks consist of the following parts:—an epidermis, the rete mucosum, and cortical layers, (the innermost of which is termed the liber). The epidermis and rete mucosum together form what is technically called the *coat*.

(*a*.) *Epidermis*.—This is the most external portion of the bark, and is variable in its thickness. The barks of commerce are said to be *coated* (*cinchona cum cortice exteriore* of Bergen) when the epidermis is present, but when this is absent, and when also part or the whole of the next layer (rete mucosum) has been removed, such barks are called *uncoated* (*cinchona nuda* of Bergen). As the epidermis is useless, or nearly so, in a medicinal point of view, uncoated barks are to be preferred, since the epidermis increases the weight of the bark, without adding any thing to its real value. In reference to this layer, there are several characters deserving of attention in judging of the quality of bark: thus, Cinchona barks, with a whitish epidermis, are, I believe, for the most part, inferior to those in which this layer is brown. But a whitish coating given to a brown epidermis by some crustaceous lichens must not be mistaken for a genuine white epidermis. The term *warty* or *knotty* (*cinchona nodosa* of Bergen) is applied to those barks in which we observe prominences on the epidermis, corresponding to elevations on the subjacent parts. These are frequently observed in some specimens of red bark, as well as in the kind called Huamalies. Bark is termed *cracky* or *furrowed* (*cinchona rimosa* of Bergen) when we observe cracks or furrows (the latter may be regarded merely as larger kinds of cracks) on it. When we observe longitudinal or transverse elevations, we say the bark is *wrinkled* (*cinchona rugosa*).

(*b*.) *Rete mucosum; cellular envelope; medulla externa*.—This is a cellular layer, placed immediately beneath the epidermis. It is tasteless, and is of no medicinal value. In old barks (particularly old red bark), it is often much developed: in uncoated bark it is sometimes, though not always, absent.

(*c*.) *Cortical layers*, or *cortex*.—These are beneath the rete mucosum, and, in fact, form the essential part of the bark. One layer is formed annually, and hence their number, and consequently the thickness of the bark, depends on the age of the tree from whence it is taken. The last formed layer, that which is the innermost, is termed *liber*. Every one of the cortical layers has medicinal virtue, but the liber the most. The reason for this will be readily comprehended by reference to the physiology of exogenous plants. The *succus communis* of these plants ascends by the alburnum, or sap-wood, to the leaves, where it undergoes certain changes by the agency of the atmosphere, in consequence of which it is converted into what is called *succus proprius*, the proper juice of the plant, and in which any medicinal activity which the latter possesses usually resides. Now this succus proprius descends in the liber: hence this part may always be expected to possess the proper medicinal activity of the tree from whence it is taken.

Quilling of the Bark.—Bark, little or not at all curled, is called in commerce *flat bark* (*cinchona plana*). The absence of the curl arises from one of two circumstances—the age of the stem from which the bark is taken, or the want of flexibility of the bark even in the fresh state. When bark is rolled cylindrically in a quilled form, it is termed *quilled bark* (*cinchona tubulata*). Bergen speaks of several kinds of quilling; namely, the *partially quilled* (*cinchona subconvoluta*), when the two edges of the quill approximate; the *closely quilled* (*cinchona convoluta*), when the edges of the quill overlap each other, forming a more or less closely rolled up tube; and the *doubly quilled* (*cinchona involuta*), when both edges of the quill are rolled together, so as to form two cylinders, but which, seen from the back, appear as one.

Fracture.—The transverse fracture of bark furnishes an important character. Bergen admits three kinds of it:—1st, *smooth*, *even*, or *short fracture* (*fractura plana*); 2dly, *resinous fracture* (*fractura resinosa*); and, 3dly, *fibrous fracture* (*fractura fibrosa*). Bark with a resinous fracture is usually to be preferred.

Colour, Taste, and Smell.—Little need be said of these characters. The same kind of bark often varies in its colour, while several kinds may have the same tint. Moisture usually deepens the colour.

(*b.*) *Classification.*—A *botanical* classification of the Cinchona barks I hold to be at present impracticable; and moreover, if it were practicable, it would be, in a commercial and pharmaceutical point of view, useless, since the barks are never accompanied by the other parts of the tree from which the botanical characters are drawn.

A *chemical* classification, I think, cannot be at present attempted with any great chance of success. The arrangements founded on chemical composition, adopted by Goebel (*Pharm. Waarenk.*) and Geiger (*Handb. d. Chem.*) will be noticed hereafter. Even if a perfect chemical classification of the barks could be effected, it would not be available to ordinary experimentalists.

An arrangement founded on the *physical* characters of the barks will be for the present, perhaps, the most useful, and is the one generally followed.

Von Bergen (*Versuch einer Monographie der China*, Hamburg 1826) admits nine species*; viz.—

1. *China rubra*, or *Red Bark.*
2. *China Loxa*, or *Crown Bark.*
3. *China Huanuco*, or *Gray* or *Silver Bark.*
4. *China regia*, or *Yellow Bark* of English commerce.
5. *China flava dura*, or *Hard Carthagena Bark.*
6. *China flava fibrosa*, or *Woody Carthagena Bark.*
7. *China Huamalies*, or *Rusty Bark.*
8. *China Jaen*, or *Ash Bark.*
9. *China Pseudo-Loxa*, or *Bastard Crown Bark.*

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* I am indebted to the kindness of Von Bergen for illustrative examples of these and other varieties of Cinchona, by which I have been enabled to identify the species with those known in English commerce.

Professor Guibourt* (*Hist. abrég. des Drog. simpl.* Paris 1836) has described no less than thirty-seven varieties of Cinchona barks, which he has arranged under five heads, as follow:—

1. *Gray Cinchonas.*
2. *Yellow Cinchonas.*
3. *Red Cinchonas.*
4. *White Cinchonas.*
5. *False Cinchonas.*

I shall adopt the following arrangement:—

Div. I. Genuine Cinchona Barks.

Section 1. *With a Brown Epidermis.*

α. Pale or Gray Cinchonas.
β. Yellow Cinchonas.
γ. Red Cinchonas.

Section 2. *With a Whitish Epidermis* (*White Cinchonas*, Auctor).

α. Pale or Gray Cinchonas.
β. Yellow Cinchonas.
γ. Red Cinchonas.

Div. II. False Cinchona Barks. (Obtained from genera, allied to, and which have been mistaken for, Cinchona).

Division 1. Genuine Cinchona Barks. *Sect.* 1st. Barks with an epidermis normally brown.—To this division belong the *pale*, *yellow*, and *red cinchonas* of English commerce. The epidermis of these is naturally reddish, brownish, or blackish, cracked, and rugous. It frequently has a whitish appearance, owing to the adherent crustaceous lichens. By scraping, however, we readily detect the subjacent brown epidermis, and thereby easily distinguish this lichenoid coat from a white epidermis.

α. *Pale Cinchona bark* (*Cinchona pallida*; *Gray Cinchona*, Guibourt).—In English commerce three kinds of cinchona are termed *pale bark*. These are *crown* or *Loxa cinchona*, *silver or gray cinchona*, and *ash cinchona*. Guibourt considers *Huamalies cinchona* to belong to the same group.

Pale barks (Huamalies cinchona excepted) possess the following properties:—They always occur in quills, never in flat pieces. Their powder is more or less pale, grayish, or fawn-coloured, and their taste is astringent and bitter. They contain *cinchonia* and *quinia*. An infusion of pale bark does not deposit any sulphate of lime on the addition of a solution of the sulphate of soda.

1. *Cinchona Coronæ*, E.—*Crown* or *Loxa Bark.*

Cinchona officinalis, *D.*

(*Cinchona lancifolia*; Cortex, *L. D.*—Bark of *Cinchona Condaminea*, E.)

Synonymes.—*Quinquina de Loxa*, Guibourt. *China Loxa*; *Kron-China*, Bergen. *Cortex Chinæ fuscæ*, seu *coronæ*, s. *de Loxa*, s. *peruvianus*, Goebel.

History.—Loxa bark, if not the first, was one of the earliest kinds of Cinchona

* By an interchange of specimens, M. Guibourt and myself have been able to determine the synonymes of the barks known in English and French commerce.

bark introduced into Europe. It was, probably, the bark which Horbius (Bergen, *Monogr.* S. 313), in 1693, denominated *Cascarilla della Oja*, but which Condamine more correctly termed *Corteza*, or *Cascara de Loxa*. Some doubt, however, has existed in the minds of pharmacologists, whether the bark known in commerce by the name of Loxa bark, is identical with that formerly called by that name. Hayne (Goebel and Kunze, *Pharm. Waarenk.* i. 36) has pointed out some differences between the Loxa bark of commerce and a bark found in Humboldt's collection, marked *Quina de Loxa*, and which has been collected from the *C. Condaminea*: the peculiar characteristics of the latter are the warty prominences, the transverse cracks, which do not form rings, the browner tint of the outer surface, and a more astringent taste. In a chest of 120 lbs. of commercial Loxa bark, Goebel found only three ounces of bark corresponding to the description here given of the true Loxa bark.

Loxa bark received the name of *crown bark* in consequence of its use by the royal family of Spain. In October 1804, a Spanish galley, returning from Peru, was taken by our countrymen off Cadiz. Among the treasures found therein were many parcels of Cinchona bark, two sorts of which were distinguished from the others by their external appearance and mode of packing. Two of these chests were marked "*Para la real familie*," i. e. "*For the royal family*," and were lined with sheet iron: they contained fine quills, of thirteen inches long, tied up by means of *bass* into bundles of about three inches in diameter. Von Bergen states, he received from England, in 1824, similar bundles, under the name of *second crown*. The other sort was marked "*Para la real corte*," i. e. "*For the royal court*" (Bergen, *Monogr.* S. 310).

Botany.—Loxa bark is undoubtedly the produce of *C. Condaminea*. Guibourt (*Hist. des Drog.* ii. 55) examined the young barks of this species, brought by Humboldt, and found them undistinguishable from Loxa cinchona. Furthermore, he found that a specimen of cinchona, sent over by M. Joseph de Jussieu, the colleague of Condamine, as being the bark of the tree described by that celebrated academician, is similar to the crown bark of commerce.

Commerce.—Crown or Loxa bark is imported in serons (holding from sixty to ninety lbs.) and in chests (containing about one hundred lbs.)

Essential Character.—*Coat* thin, firm; *cracks* numerous, annular, transverse; *under surface* smooth; *colour* cinnamon-brown (Bergen)

Description.—Loxa or Crown bark is met with in the form of coated quills only, neither flat nor uncoated pieces being known. These quills vary in length from six to fifteen inches; in diameter from two lines to an inch; in thickness from one-third of a line to two lines: they are both singly and doubly quilled. The outer surface or epidermis of this bark is characterised by numerous transverse cracks, which, in the fine and middling quills, are often distant from each other only from one to one and a half lines, and frequently extend completely around the bark in the form of rings, the edges of which, as well as of the shorter cracks, are a little elevated. In some of the fine quills, however, these transverse cracks are hardly visible; but we then observe longitudinal furrows. On the larger quills the transverse cracks are interrupted, and do not form rings, and are not set so closely together. Some of the thicker quills have occasionally almost the roughness of a grater, and occasionally pieces are met with having knots or warts. The colour of the external surface of Crown bark depends principally on that of the crustaceous lichens. Gray, or grayish-brown, may be taken as the predominating tint: the thin quills are mostly slate, ash, or roe-gray. The larger quills vary still more, and, in addition to the colours now mentioned, they are sometimes blackish-gray, even passing, in places, into liver-brown. The inner surface of Loxa bark is smooth, with small irregular longitudinal fibres observed thereon: its general colour is cinnamon-brown. The transverse fracture of small quills is even, but of the larger and coarser ones fibrous. The powder of Loxa bark is of a deep cinnamon-brown colour. The odour of this bark is like that of tan; its taste astringent, bitter, and somewhat aromatic.

Commercial and other Varieties.—The finest, thinnest, and longest quills, with a short transverse fracture, form the *finest* or *picked crown bark* of the shops (*cortex cinchonæ coronæ electus*). A somewhat larger quill, with a silvery appearance of the epidermis, derived from the adherent crustaceous lichens, constitutes the *silvery crown bark*. A similar kind, but in which the external coat has a speckled appearance from the whitish lichens, with the intermediate dark-brown colour of the epidermis, constitutes the *leopard crown bark*.

Huamalies and *white Loxa Cinchona*, found in the serons of pale bark, are the produce of different species of *Cinchona*. The *young Huamalies Cinchona*, sometimes called *Havannah bark*, constitutes the *rusty crown bark* of some of our dealers. It has scarcely any transverse cracks; and some subvarieties of it are devoid of lichens. Its epidermis is spongy or corky, longitudinally furrowed in an undulatory matter, and of a grayish or brownish gray tint. The *ferruginous Huamalies* of Guibourt is the same bark at a more advanced period of growth. Huamalies bark is the produce of *C. micrantha*, and will be described more fully hereafter. *White Loxa Cinchona* has a considerable resemblance to the young Huamalies bark, with a whitish epidermis, and will be noticed among the so-called *White Cinchonas!*

Composition.—Crown bark was analyzed by Pelletier and Caventou (*Journ. de Pharm.* vii. 70), and by Bucholz (Gmelin, *Handb. d. Chem.* ii. 1283).

Pelletier and Caventou's Analysis.

Kinate of cinchonia.
Kinate of lime.
Green fatty matter.
Red cinchonic.
Soluble red colouring matter (tannin).
Yellow colouring matter.
Gum.
Starch.
Lignin.

Gray Cinchona.

Bucholz's Analysis.

Cinchonia	0·36
Kinic acid	1·17
Kinate of lime	1·30
Hard resin (red cinchonic)	9·97
Bitter soft resin	1·56
Fatty matter, with chlorophylle	0·78
Tannin, with some chloride of calcium (?)	5·80
Gum	4·43
Starch	a little
Lignin	74·43
Commercial Loxa Bark ...	99·80

Soubeiran (*Traité de Pharm.* i. 603) states, that one lb. of Loxa bark yields from one and a half to two drachms of sulphate of cinchonia. It is somewhat remarkable, that Von Santen (Bergen, *Monogr.* Tab. zur 5ten. Platte) obtained quina, and but little cinchonia, from Loxa bark, as the following table shows:—

One lb. of Loxa Bark.	*Sulphate of Quina*	*Pure Cinchonia.*
Fine selected quills	5 grs.	——
Moderately thick quills and pieces	12 grs.	$4\frac{2}{3}$ grs.
Fine and middling quills	2 grs.	$2\frac{2}{3}$ grs.
Moderately thick pieces	$21\frac{1}{3}$ grs.	——
Selected thick, heavy pieces, with grater-like bark	$53\frac{1}{4}$ grs.	——

Cryptogamia.—The following is Fée's list of the Cryptogamia found on Loxa bark:—

Lichenes.—*Opegrapha globosa; O. Condaminea; Graphis fulgurata; Arthonia sinensigraphia; A. marginata; Glyphis favulosa* (rare); *Chiodecton effusum; Pyrenula verrucarioïdes; Ascidium Cinchonarum; Lepra flava; Lecidea peruviana; Lecanora russula; L. subfusca; id.* var. *β pulverulenta; Parmelia crenulata; P. glandulifera; Sticta aurata; Collema azureum;* and *C. diaphanum.*

2. *Cinchona Huanuco.—Gray* or *Silver Cinchona*, E.

Cinchona cinerea, *E.*

(Bark of *Cinchona micrantha*, E.)

Synonymes.—*Quinquina de Lima*, Guibourt. *China Huanuco; Graue China*, Bergen. *China Huanuco, Yuanuco, Guanuco, Havane*, Goebel. *Cascarilla provinciana*, Pöppig.

History.— This bark was first known in Spain in 1799. One hundred and eighty chests of it were brought to Santander, in that year, by the frigate La Veloz; and Ruiz was appointed to examine the cargo. He found in the chests a thick bark, till then unknown to the botanists of Peru, mingled with the barks of *C. nitida* and *C. lanceolata*, and with those of the species which Tafalla has designated by the term *similar to Calisaya* (Laubert's *Memoir* in Lambert's *Illustr. of the Genus Cinchona*, p. 78). Pöppig (Hooker's *Comp. to the Bot. Mag.* No. viii. p. 244) says, the trade in the barks of Huanuco commenced in 1785; but that in 1815 it almost entirely ceased. The scarcity of yellow bark will be likely again, I should think, to give a fresh impulse to it, as the quality of Huanuco bark is excellent.

Botany.—It is unnecessary to detail the speculations of botanists as to the origin of this bark previous to Pöppig's discovery. This celebrated traveller brought to Europe a bark called *cascarilla provinciana*, and which was the produce of *Cinchona micrantha*. Reichel, an apothecary at Hohenstein, examined and carefully compared it with his own collection of cinchona barks, as well as with that of Von Bergen at Hamburg, and declared it to be identical with the *Huanuco* or *Silver Bark* of commerce.

Commerce.—It is imported usually in chests containing about 150 pounds, and also, though less frequently, in serons of from 80 to 100 pounds.

Essential Character.—*Coat* moderately thin, hard; *wrinkles* longitudinal, predominating; *under surface* splintery; *colour* rusty brown (Bergen).

Description. — It always occurs in the form of quills, no flat pieces being known. These quills are larger and coarser than those of Crown bark: the largest even approximate to those of yellow bark, from which they are distinguished by the greater smoothness of their external surface. The length of the quills is from three to fifteen inches; their diameter from two lines to one and a quarter, or even two inches; their thickness one-third of a line to five lines. At the edge of most of the perfect quills we distinctly observe a sharp oblique cut, made probably to loosen the bark. These oblique cuts are rarely found on other barks. The quills are frequently somewhat spirally rolled. We observe on the epidermis transverse cracks, but they do not form rings, as in the Loxa or crown bark, and their edges are flat. On the thicker quills longitudinal furrows are observed; and in these cases the transverse cracks are frequently wanting. The colour of the epidermis is whitish: in the smaller quills it is a uniform whitish gray, while in the large quills we observe a kind of cretaceous covering. This whitish appearance, from which, indeed, the terms *silver* and *gray* given to this bark are derived, depends on some crustaceous lichens. The structure of the inner surface of this kind of bark is, in the small quills, smooth; in the larger ones fibrous: the colour is rather reddish, or rusty brown, than cinnamon brown. The fracture is even, and resinous; the odour clayish or sweet, and which Bergen says is peculiar to this kind. The taste is astringent, aromatic, and bitter; the powder of a deep cinnamon brown.

Commercial and other Varieties.—In this country no varieties of Huanuco bark are usually made. Guibourt distinguishes the *gray fine Lima*, the *large* or *white Lima*, and the *gray Huanuco*; to which he also adds, the *gray cinchona resembling the royal yellow bark.*

Composition.—I am unacquainted with any analysis of this bark. Soubeiran (*Traité de Pharm.* i. 603) states, that one lb. of *Gray Lima Cinchona* yields a drachm and a half of sulphate of cinchonia.

The following are the quantities of pure cinchonia and quinia in this bark, according to the undermentioned authorities:—

		In one lb. of bark. Cinchonia.		Quinia.
Von Santen		from 74 to 210 grs.	....	0
Michaelis	finest sample	50 grs.	....	32 grs.
	second sample	74 grs.	....	28 grs.
Goebel and Kirst		168 grs.	....	0

Cryptogamia.—Mosses and Jungermannias are never found on this bark. Foliaceous lichens are much more scarce than on Loxa bark. The following is Fée's list of the Cryptogamia:—

Lichenes.—*Opegrapha Ruiziana; O. Condaminea; O. rugulosa; O. tumidula; Graphis Acharii; G. serpentina; Arthonia confluens; A. divergens; A. obtrita; Trypethelium variolosum; Pyrenula marcida; P. myriocarpa; P. mollis; Verrucaria nitens; V. theïoplaca; Ascidium Cinchonarum; Lecidea tuberculosa.*

3. *Cinchona Jaen.—Ash Cinchona.*

(Bark of *Cinchona ovata*, Fl. Peruv.)

Synonymes.—*Quinquina de Loxa cendré*, Guibourt. *China Jaen; Blasse Ten-China*, Bergen. *China Jaen*, seu *Tenn*, s. *Tena*, Goebel. *Blackish Huanuco*, Batka. *Cascarillo pallido*, Ruiz.

History.—Little is known respecting the history of Ash Cinchona, in consequence, probably, of its being confounded with other kinds of pale bark. It is uncertain, therefore, at what period it was introduced into commerce. Bergen states he found it in an old collection of drugs made in 1770. Virey (*Hist. Nat. des Medic.* p. 210) refers to it under the name of *pale gray* or *female Loxa cinchona;* but it does not appear to have been known to other French pharmacologists until I sent samples of it to Professor Guibourt, who has described it, erroneously I think, as a variety of Loxa bark (see his *Hist. des Drog.* ii. 52-3).

BOTANY.—This kind of cinchona bark agrees with the one described in the *Quinologia* as *cascarillo pallido* (*C. ovata*, Fl. Peruv.); a specimen of which, in Ruiz's collection of barks, was examined by Bergen (*Monogr.* 319), and found to be identical with Ash Cinchona.

COMMERCE.—It is usually imported in chests of from 110 to 140 lbs.; but we meet with it also in serons of from 70 to 100 lbs.

ESSENTIAL CHARACTER.—*Coat* thin, light, readily pulverized; *cracks* few; *quills* mostly crooked; *colour* dark cinnamon brown (Bergen).

DESCRIPTION.—This bark is met with in a quilled form only: the quills being of middling size, or somewhat thick; being from 4 to 16 inches long, from 3½ lines to 1 inch diameter, and from ½ to 2 lines thick. A very remarkable character of this bark is the crookedness of the quills, which are more or less arched and twisted; from which circumstance we may infer the probability of its being obtained from a tree which grows in a damp situation. On the outer or epidermoid surface we observe a few transverse cracks, and some faint longitudinal cracks; but in these respects there is a manifest difference between this and Loxa bark. The colour of the outer surface varies between ash gray, whitish gray, and pale yellow, with blackish or brownish spots. The inner surface is either even or splintery, and of a cinnamon brown colour. The fracture is even or splintery; the odour is tan-like; the taste feebly astringent and bitter; the colour of the powder is cinnamon brown.

COMMERCIAL VARIETIES.—No division of ash cinchona is made. Bergen has described, under the names of *Dark Ash Cinchona*, *False Loxa Bark*, or *Dark Ten Cinchona* (*China Pseudo-Loxa*; *Dunkele Ten China*), a bark which has many of the properties of ash cinchona, and which is found mixed with the Loxa bark of commerce. It is principally distinguished from the ash cinchona by the irregular longitudinal wrinkles and transverse cracks, and by its darker colour. Guibourt regards it as an inferior kind of Loxa bark. Bergen says it agrees with a bark in the collection of Ruiz, said to be obtained from the *C. lancifolia* of Mutis.

COMPOSITION.—Ash Cinchona has not been analysed. It appears to be remarkably deficient in cinchona alkalies. Von Santen (Bergen, *Monogr.*) failed to procure either quinia or cinchonia from it. Michaelis, and Goebel and Kirst (*Pharm. Waarenk.* i. 67) obtained the following quantities of quinia and cinchonia from it:—

1 *lb. of Bark.*		*Quinia.*		*Cinchonia.*
Michaelis	1st sort (*Cinchona fusca Ten*) ..	44 grs.	....	12 grs.
	2nd sort	80 grs.	....	12 grs.
Goebel and Kirst	....	12 grs.	....	none.

CRYPTOGAMIA.—Few cryptogamic plants are found on this bark. The following is a list of them, according to Bergen (*op. cit.* S. 318):—

LICHENES.—Graphis sculpturata; Porina granulata; Pyrenula verrucarioïdes; Lecanora punicea; Parmelia melanoleuca, and *Usnea florida δ Cinchonæ.*

The DARK ASH CINCHONA (Bergen), of all others, abounds most in lichens. Besides some of the foregoing, the following lichens have also been found on it:—*Opegrapha scapella; Thelotrema terebratum*; and *Sticta aurata.*

4. *Cinchona Huamalies.—Huamalies* or *Rusty Bark.*

(Bark of *Cincho'na purpu'rea*).

SYNONYMES.—*Quinquina de Huamalies*, and *Q. humalies ferrugineux*, Guibourt. *China Huamalies*; *Braune China*, Bergen. *China Huamalies*, *Guamalies*, seu *Abomalies*, Goebel. *Braune China; China Huamalies; China fusca*, Geiger.

HISTORY.—It is not known precisely when this kind of bark first came into Europe. Von Bergen thinks that it probably was introduced simultaneously with *silver bark* at the end of the last or commencement of the present century. In 1803 it was frequently carried direct from Lima to Hamburg. This bark is not used as a distinct kind in this country, and hence most druggists are unacquainted with it; but it is bought by some of our merchants for the foreign markets, especially for Germany.

BOTANY.—The bark of *Cinchona purpurea*, R. and P. (*Cascarilla boba colorada*), brought from South America by Pöppig, was found, by Reichel, to be identical with the Huamalies bark.

COMMERCE.—It is imported in chests, never in serons.

ESSENTIAL CHARACTER.—*Coat* thin and spongy; longitudinal *wrinkles* and *warts*, which penetrate to the *cortical layers* [alburnum, *Bergen*]; *under-surface* even; *colour* rust-brown (Bergen).

DESCRIPTION AND VARIETIES.—This kind of bark presents very different appearances at different ages, so as almost to defy arrangement. Some of the fine quills might readily be mistaken by inexperienced persons for *Crown bark*, while others greatly resemble *white Loxa bark*. The large flat pieces, on the other hand, I have known mistaken by an experienced dealer for what he termed "flimsy" red bark.

Some of the finer quills (*Huamalies, simulating Crown Bark*) greatly resemble those of Loxa or Crown Bark, but are paler externally, have fewer transverse cracks, are smoother, or finely wrinkled longitudinally, and, when broken, appear nearly white in the interior. Another kind (*Gray-corky Humalies Bark*) I have frequently found in the Loxa Bark of commerce. It occurs in larger quills, which have a whitish or grayish corky or spongy epidermis, which is striated or furrowed longitudinally, and may be removed by the nail. On some of the pieces we observe rustly-coloured warts, which, when numerous, are disposed in irregular longitudinal lines. A flat variety (*White-verrucous Huamalies Bark*) has a whitish epidermis, with large red warts, from which the epidermis has been removed. Another kind (*Rusty Huamilies; Quinquina ferrugineux*, Guibourt) is in quills or flat pieces, distinguished by the ochre-red or rusty colour of its outer surface, the presence of warts, arranged for the most part longitudinally, and the almost total absence of transverse cracks.

COMPOSITION.—I am unacquainted with any analysis of this bark. The following are the quantities of Cinchona alkalies according to Von Santen (Bergen, *Monogr.* Platte v.), Michaelis, and Goebel and Kirst (*Pharm. Waarenk.* i. 64):—

	1 *lb. of Bark.*	*Cinchonia.*	*Quinia.*
Von Santen	1. Fine and Middling-fine quills, and flat pieces (from Cadiz in 1821)	60	0
	2. Thick warty quills, and flat pieces (from ditto)	75	0
	3. Sorts (from Lima in 1803)	60	0
	4. As No. 3 (another chest) rather heavy	48	0
	5. As No. 3 (a third chest) rather light	95	0
Michaelis	1st sort	0	12
	2nd sort	48	28
	3rd sort	60	34
Goebel and Kirst (fine and thick quills of commerce)		38	28

CRYPTOGAMIA.—The following cryptogamic plants are mentioned by Von Bergen as existing on this bark.

LICHENES. — *Opegrapha enteroleuca; Graphis duplicata; Verrucaria phœa; Porina papillata; Pyrenula discolor; P. mastoidea;* and *P. verrucarioïdes; Lecanora punicea; Parmelia melanoleuca;* and *Usnea florida δ Cinchonæ.*

β. *YELLOW CINCHONA BARK OF ENGLISH COMMERCE* (*Cinchona flava*, Anglic. offic.)—In English commerce the term *yellow cinchona* is confined to the quilled and flat varieties of *Calisaya* or *regia bark.* The French and German pharmacologists, however, include under this denomination several of the *yellow barks, with a white epidermis* (see p. 989), which in England are termed *false* or *spurious yellow barks.* The yellow bark of English commerce occurs in quills or flat pieces, the quills being, on the average, larger and much rougher than the largest quills of pale barks. The texture is more fibrous; and the taste is more bitter, and less astringent than of pale bark: the powder is orange or fawn yellow. The Calisaya or royal yellow contains both quinia and cinchonia, but the first in by far the larger quantity. A strong infusion of this kind of bark produces a precipitate (*sulphate of lime*) on the addition of a solution of the sulphate of soda.

Cinchona Calisaya seu *Regia.—Royal Yellow Bark.*

Cinchona flava, *E. D.*

(*Cinchona cordifolia*; Cortex, *L. D.*—Yellow-Bark; from an unascertained species of Cinchona, *E.*)

Synonymes.—*Quinquina Calisaya* ou *Jaune royal*, Guibourt. *China regia; Königs-China*, Bergen. *China regia; Cortex Chinæ regius*, s. *flavus*, s. *luteus; China Calisaya*, Goebel.

History.—Dr. Relph (*Inq. into the Med. Effic. of Yellow Bark*, 1794) says, that in a letter from a Spanish merchant at Cadiz, dated September 1789, it is observed that the *yellow bark* had only been lately known there. "The first parcel which arrived here was tried at Madrid, and was immediately bought by the King's order for his own use." In 1790 Murray (*App. Med.* vi. 178) first saw it at Franckfort on the Maine. He afterwards received it under the name of *cortex chinæ flavus;* and to prevent confusion he proposed to term it *royal yellow bark* (*cortex chinæ regius flavus.*) Dr. Relph says it was unknown in England till 1793; but this must be an error; for Murray, who died in 1791, had received it from London. It is not improbable that it may be the *amarilla* (*yellow*) *cinchona* mentioned by Arrot (*Phil. Trans.* 1737-8, vol. xl. No. 446, p. 81—6); by Condamine (*Mém. de l'Acad. Royale des Scien.* 1738, p. 226); and by J. de Jussieu (*Hist. de la Soc. de Méd.* 1779, p. 252); but this cannot be ascertained now. The term *Calisaya*, applied to this bark in Spain and Portugal, is the name of a province producing the bark (Humboldt in Lambert's *Illustr.* p. 53).

Botany.—The species yielding this bark is at present unascertained.

Humboldt and Bonpland (*Pl. Æquinox*, i. 66) ascribe the *Quina jaune* (*yellow cinchona*) to *Cinchona cordifolia*, Mutis. Mr. Lambert (*Illustr.* p. 4) also states that *Quina amarilla Bogotensium* (*Bogota yellow cinchona*) is produced by *C. cordifolia* Mutis. These statements, I presume, led Hayne (quoted by Bergen, S. 285), the compilers of the *Pharmacopœia Londinensis*, 1836, and others, into the error of supposing that the *yellow bark of English commerce* is identical with the *Quina jaune* of Humboldt and the *Quina amarilla* of Lambert, and that consequently it is the produce of *C. cordifolia.* But Bergen (*Monog.* S. 293) states that the *Quina amarilla* (*C. cordifolia*, Mutis) contained in Ruiz's collection of barks, which he examined, was *China flava dura* (the bark known in England as *hard Carthagena bark*). And Guibourt (*Hist. des Drog.* ii. 79) observes, that "many persons have referred the *true Calisaya* to *C. cordifolia*, in consequence of Mutis having given the name of *yellow bark* to the bark of this tree; but the authentic specimens of the yellow bark of Mutis, brought by Humboldt, shew that this bark is that known in France by the name of *Carthagena cinchona.*"

Ruiz (Laurent's *Memoir* in Lambert's *Illustr.* p. 70) thought it was the bark of *C. lanceolata*; and Dr. Lindley (*Fl. Med.* 417) adopts this notion. But Bergen (*Monogr.* S. 285) says he found in Ruiz's collection some specimens of *Quina naranjada* (*C. lancifolia*, Mutis), of *Quina anteada* (*C. lanceolata*, Fl. Peruv.), and of *Quina peruviana* (*C. nitida*, Fl. Peruv.), all of which are very different to our *yellow cinchona* (*royal* or *Calisaya yellow bark*). Guibourt (*Hist. des Drog.* p. 80) observes that great differences exist between our *yellow cinchona* and the *orange cinchona* (*C. lancifolia*, Mutis).

Commerce.—It is imported in serons and chests. The whole serons weigh 125 to 135 lbs.; the thirds, 45 to 50 lbs. The chests contain 150 lbs. I am informed by Messrs. Gibbs and Sons, Contractors for the Cinchonas, that the Yellow Bark is produced in the province of La Paz in Bolivia, in a plain bounded east and west by mountain ridges, and elevated 14 or 15,000 feet above the level of the sea. It is exported from Arica. This information agrees with that received by Dr. Wood (*United States Dispensatory*), and with the statements of Delondre (*Journ. de Pharm.* xxi. 505).

Essential Character.—*Coat* very thick, brittle; *furrows* longitudinal; *cracks* predominating, transverse; *under-surface* uneven; *colour* deep cinnamon-brown (Bergen).

Description.—In commerce, two varieties are distinguished: the *quilled* and the *flat.*

(*a.*) *Quilled yellow bark (cinchona regia tubulata* seu *convoluta*).—The quills vary in length from three to eighteen inches; in diameter, from two lines to one and a half or even two inches; in thickness, from half to six or seven lines. Very small quills, however, are rare; those usually met with having a diameter of from one to one and a half inches, and a thickness of from three to six lines. Sometimes they are doubly, though in general they are singly, quilled. The quills are in general coated. On their external surface they are marked by longitudinal wrinkles and furrows, and predominating transverse cracks, which often form complete circles around the quills, and whose edges are usually raised. These furrows and cracks give a very rough character to this kind of bark, by which, indeed, it may be readily distinguished from the large quills of the gray or Huanuco bark. The colour of the epidermis is more or less light gray; in those spots where the epidermis is wanting, the outer surface of the bark is of a brown colour. In other characters the quilled and flat characters agree.

The finest quills are selected for druggists' show-bottles.

(β.) *Flat yellow bark* (*cinchona regia plana*).—The pieces of this variety are from eight to fifteen even or eighteen inches long; from one to three inches broad, and from one to five lines thick. They are but little curved or arched. In general the pieces are uncoated (*cinchona regia nuda*). Sometimes the uncoated pieces are found, by drying, to have become convex on the inner, and concave on the outer side. When the coating is present, it agrees in character with the coated quilled yellow bark already described, in having wrinkles, furrows, and transverse cracks, and in the colour of the epidermis.

The inner surface of both quilled and flat pieces is even, and often almost smooth. On examination, it is seen to consist of fine, closely-set, longitudinal fibres. Its colour is cinnamon-brown; the same colour is also perceived on the outer side of the bark in the places where the coating is removed.

Commercial and other Varieties.—The only distinctions made in commerce are into *quilled* and *flat yellow cinchona;* the flat being subdivided into the *coated* and *uncoated.*

The bark, called by Guibourt, *Quinquina jaune du roi d'Espagne*, is unknown in English commerce. Guibourt says, that it has an odour like that of tobacco, and that it consists principally of young barks, resembling *Calisaya* or *Royal Yellow Cinchona* (the *Yellow Cinchona* of English commerce). Is it the *Cascarilla hoja de Oliva* (*Cinchona nitida*, R. P.?) of Pöppig?

Mutis's *Orange Cinchona of Santa Fé* I once met with in the docks under the name of *New Spurious Yellow Bark.* This, as well as the *Carthagena Barks*, sometimes mistaken for the Royal Yellow bark, will be noticed among the *White Cinchonas.*

Composition.—Pelletier and Caventou (*Journ. de Pharm.* vii. 89) found in this bark *superkinate of quina, kinate of lime, red cinchonic, soluble red colouring matter* (tannin), *fatty matter*, *yellow colouring matter*, *lignin*, and *starch*. In 1827, Pelletier (*Dict. Mat. Méd.* v. 603) consumed 2,000 quintals of this bark in the manufacture of 90,000 ounces (French) of disulphate of quina: this is about three drachms of disulphate for one lb. of bark; Soubeiran (*Traité de Pharm.* i. 603) states that one lb. (French) of *uncoated yellow bark* yields three drachms and from 30 to 50 grains (French) of disulphate of quina; while the same quantity of *coated yellow bark* yields three drachms (French) of the disulphate. I have been informed, by some manufacturers, that an ounce of the disulphate has been obtained from two lbs. of yellow bark; but this is beyond the average produce.

Cryptogamia.—The following is Fée's list of the cryptogamic plants found on this bark (*Cours d'Hist. Nat.* ii. 262).

1. Fungi.—*Hypochnus rubro-cinctus; Triclinum Cinchonarum.*
2. Lichenes.—*Opegrapha peruviana; O. Scaphella; O. ovata; O. rhizocola; Graphis cinerea; G. cinnabarina; Arthonia obtrita; Fissurina Dumastii; Chiodecton sphærale; Trypethelium verrucosum; T. chiodectonoïdes; Pyrenula annularis; Porina americana; Ascidium Cinchonarum; Lepra flava; Variolaria amara; Lecidea aurigera; L. tuberculosa; L. soredifera; L. punicea; Parmelia perlata; Sticta macrophylla; Collema azureum; Solorina vitellina; Usneæ floridæ et barbatæ.*
3. Hepaticæ.—*Jungermannia atrata.*
4. Musci.—*Hypnum Langsdorfii.*

γ. *Red Cinchona Bark of English Commerce* (*Cinchona rubra*, Anglic. offic.)—Only one kind of red bark is usually found in English commerce. It is met with in both quills and flat pieces: it has a fibrous texture, and a redder colour than either of the foregoing kinds: it contains both quinia and cinchonia. It is very bitter and astringent. Its powder is more or less red.

Cinchona rubra, E. D.—*Red Cinchona.*

(*Cinchona oblongifolia*; Cortex, *L. D.*—Red Bark, from an undetermined species, *E.*)

Synonymes.—*Quinquina rouge verruqueux*, and *non-verruqueux*, Guibourt. *China rubra*; *Rothe China*, Bergen. *China rubra*; *Cortex Chinæ ruber*, Goebel.

History.—It is probable, as Bergen suggests, that this red bark was known to the earliest travellers in South America, who have noticed the cinchona bark. Arrot, as well as Condamine, speak of a red bark (*colorada*) of the best quality. Dr. Saunders (*Observ. on the super. Efficacy of the Red Peruvian Bark*, p. vi. 1782) states, that in the year 1702 a parcel of bark (which he says was the red kind) was taken on board a Spanish vessel, and a portion of it fell into the hands of a celebrated London apothecary, Mr. D. Pearson. In 1779, another Spanish ship, bound from Lima to Cadiz, was taken by an English frigate, and carried into Lisbon. Her cargo consisted principally of red bark, and was for the most part sent to Ostend, where it was purchased at a very low price by some London druggists, who, after some difficulty, contrived to get it introduced into practice.

Botany.—The species which yields the red bark is at present unascertained. It has been usually, though erroneously, supposed to be the *Cinchona oblongifolia*, Mutis, which yields a bark called *Quina roxa*, or *Quina Azahar o roja de Santa Fé*; and which was supposed to be our red bark. But Bergen has examined the bark bearing this name in the collection of Ruiz, and finds that is not our commercial red bark, but the *Quinquina nova* of the French pharmacologists. Moreover, Schrader (who received a piece of the bark of the *Cinchona oblongifolia* from Humboldt) declared it to be a new kind; and Guibourt (*Hist. des Drog.* ii. 89) states that the red bark of Mutis, which was deposited by Humboldt in the Museum of Natural History of Paris, is not commercial red bark, but *Quinquina nova*. To these statements may be added the testimony of Ruiz and Pavon, and of Humboldt; the two first of which writers state, that the *Quina roxa* is obtained from the *Cinchona oblongifolia*, Mutis, but that they do not know the origin of *Quina colorada* (the red bark of commerce); and Schrader states that Humboldt declared he did not know the tree that yielded red bark (Bergen, *Monogr.* S. 268).

Commerce.—Imported in chests; never in serons. Good samples are scarce. I am informed by an experienced dealer, this bark was formerly imported in much larger-sized pieces than are now met with.

Essential Character.—*Coat* thick, with wrinkles (longitudinal); *furrows* and *warts*, but without any important impression on the *cortical layers* [alburnum, Bergen]. *Inner surface* uneven; *colour* brownish-red (Bergen).

Description.—Red bark occurs in quills and flat pieces. The quills vary in diameter from two lines to an inch and a quarter; in thickness from one-third to two lines; in length from two to twelve or more inches. The so-called flat pieces are frequently slightly curled: their breadth is from one to five inches; their thickness from one-third to three-quarters of an inch; their length from two inches to two feet. Red bark is usually coated; its outer surface is usually rough, wrinkled, furrowed, and frequently warty. The colour of the epidermis varies: in the thinner quills it is grayish-brown, or faint red-brown; in thick quills and flat pieces it varies from a reddish-brown to a chesnut-brown, frequently with a purplish tinge. As a general rule, it may be said that the larger and coarser the quills and pieces, the deeper the colour. Cryptogamic plants are not so frequent on this as on some other kinds of bark. The rete mucosum is frequently thick and spongy, especially in large flat pieces; much more so than in yellow bark. The inner surface of the bark is, in fine quills, finely fibrous; in large quills and flat pieces, coarsely fibrous, or even splintery. Its colour increases with the thickness and size of the pieces: thus in fine quills it is light rusty brown; in thick quills and flat pieces it is a deep reddish or purplish brown. Some of the specimens of red bark, which I have received from Von Bergen, approach yellow bark in their colour. The transverse fracture of fine quills is smooth; of middling quills, somewhat fibrous; of thick quills and flat pieces, fibrous and splintery. The taste is strongly bitter, somewhat aromatic, but not so intense and persistent as that of yellow bark; the odour is feeble, tan-like; the colour of the powder is faint reddish-brown.

Commercial and other Varieties.—The obvious and common distinction is into *quilled red bark* and *flat red bark*. The warty pieces constitute the *quinquina verruqueux* of Guibourt; the pieces without warts are the *quinquina non-verruqueux* of the same pharmacologist. In the red bark of commerce, we frequently find pieces with a white micaceous epidermis: these, which are probably the produce of a distinct species of Cinchona, constitute the *quinquina rouge à epiderme blanc et micace* (*quinquina Carthagène rouge*, 2nd éd.) of Guibourt (*Hist. des Drog.* ii. 92), and will be described among the *White Cinchonas.*

The quilled red bark, called by Guibourt *Red Lima Cinchona*, is unknown in English commerce.

The consumption of red cinchona being very small, but little attention has been paid to it, and no distinctions are made of it, except into the *quilled* and the *flat*; the latter being sub-divided into *coated* and *uncoated.*

Composition.—According to Pelletier and Caventou (*Journ. de Pharm.* vii. 92), red bark contains *superkinate of cinchonia, superkinate of quina, kinate of lime, red cinchonic, soluble red colouring matter* (tannin), *fatty matter*, *yellow colouring matter*, *lignin*, and *starch.* Soubeiran (*Traité de Pharm.* i. 603) states, that one lb. of deep-red cinchona yields two drachms of sulphate of quina and one drachm of sulphate of cinchonia; while one lb. of pale-red cinchona yields a drachm and a half of the sulphate of quina and one drachm of sulphate of cinchonia.

The following are the quantities of cinchona alkalies obtained from this bark by Von Santen (Bergen, *Monogr.* Platte 1), by Michaelis, and by Goebel and Kirst (*Pharm. Waarenk.* i. 72):—

		Cinchonia.	Sulphate Quinia.	Quinia.
Von Santen	1. Fine quills of fresh appearance (from Cadiz in 1803)	70 grs.	77 grs.	
	2. Large, broad, flat pieces, of fresh brownish-red appearance (same chest)..	90	15	
	3. Middling quills, from their pale appearance probably 20 years older than the previous (from Cadiz in 1819)	97	31	
	4. Broad flat pieces, not so thick as No. 2, (same chest as No. 3)	80	30	
	5. Middling quills, heavy, old (from London to Hamburg in 1815: not met with now)	150	11	
	6. Thicker, heavier quills (same chest) ..	184	9	
	7. Thick flat pieces, quills, and fragments (above 80 years in Hamburg: a pale kind)	20	7	
Michaelis		32	—	64
Goebel and Kirst (flat pieces)		65	—	40

Cryptogamia.—The following are the cryptogamic plants on red cinchona, according to Fée (*Cours d'Hist. Nat.* ii. 265):—

Lichenes.—*Opegrapha Bonplandi; O. farinacea; Graphis Acharii; G. exilis; G. frumentaria; Pyrenula verrucarioïdes; Verrucaria sinapisperma; Thelotrema urceolare; T. terebratum; T. myriocarpum;* and *Lecidea conspersa.*

Sect. 2nd. Genuine Cinchona Barks, with a whitish or yellowish micaceous Epidermis (*Cinchona alba*, Auct.)—The *white cinchona barks* are usually regarded, in English commerce, as *spurious* or *bastard kinds of bark.* They are distinguished by an epidermis which is naturally whitish or pale yellowish, micaceous, smooth, or not cracked, and adherent to the cortical layers. They yield little or no cinchonia and quinia. One of them contains a peculiar vegetable alkali (*aricina*).

α. *Pale Cinchona Barks, with a whitish Epidermis.*—I am acquainted with only one variety of this, viz.; the *White Loxa Cinchona* of Guibourt (*Hist. des Drog.* ii. 94); unless, indeed, we consider some of the young Huamalies barks as belonging to this division (see *Gray-corky Huamalies Bark*, p. 984).

Cinchona Loxa alba.—White Loxa Bark.

Quinquina blanc de Loxa, *Guibourt.*

This is found in the *Crown* or *Loxa cinchona* of commerce; with which it agrees in its general appearance, being essentially distinguished by its whitish epidermis. It has considerable resemblance to the quilled Huamalies with a whitish epidermis, as also to Carthagena bark.

β. *Yellow Cinchona Barks, with a whitish or yellowish-white Epidermis.*—These barks correspond to, and have been confounded with, the Calisaya or Royal Yellow Bark.

1. *Cinchona de Carthagena dura.—Carthagena Hard Cinchona.*

(Bark of *Cinchona cordifolia*).

Synonymes.—*Quinquina de Carthagène jaune*, Guibourt. *China flava dura; Harte gelbe China*, Bergen. *Quina amarilla*, Mutis. *Quina jaune*, Humboldt.

History.—See *Cinchona de Carthagena fibrosa*.

Botany.—This bark is satisfactorily proved (see the evidence at p. 985) to be the produce of *Cinchona cordifolia*, Mutis.

Commerce.—It is imported in drum-like serons of about 80 lbs. nett, or in half chests of about 70 lbs.

Essential Character.—*Coat* thin and soft, or wanting; longitudinal *furrows* irregular; *under-surface* uneven or splintery; *colour* dull ochre-yellow (Bergen).

Description.—It occurs in fine, middling, and thick quills, and in flat pieces. The quills vary in diameter from three to eight lines, in thickness from half to one and a half lines, in length from five to nine, rarely to fifteen inches. The flat pieces are more or less twisted, arched, or warped (sometimes like pieces of dried horn) in drying, and are from a half to two inches broad, two to seven lines thick, and four to eight, rarely to twelve inches long. The coat, which is usually more or lesss rubbed off, is thin, soft, somewhat corky, laminated, with irregular longitudinal furrows; transverse cracks and warts are very rare. The epidermis is whitish, yellowish white, or ash gray. In the unwarted we observe, in the outer surface of the cortical layers, irregular longitudinal, but not very deep, furrows. The inner surface is smooth or splintery, frequently hollowed out. The prevailing tint of the cortical layers is usually dull ochre-yellow. The longitudinal fracture (which is with difficulty effected) is uneven, short, and coarse-splintery; the transverse fracture is short-splintery. The taste is moderately bitter, and slightly astringent. The powder is cinnamon-coloured.

Commercial Varieties.—No commercial varieties of this are known.

The *Carthagena brown bark* (*Quinquina Carthagena brun*, Guibourt) is probably only a variety. The pieces are twisted, very hard, of a chocolate-brown tint, with a yellowish-white epidermis.

Composition.—Guibourt says, that the *Carthagena yellow hard Cinchona* contains but little cinchonia, and scarcely any quinia. The following are the quantities of the cinchona alkalies, according to Von Santen, and by Goebel and Kirst:—

	One lb. of Bark.	*Cinchonia.*	*Sulphate of Quinia.*
Von Santen	1. Quills and flat pieces (from Cadiz in 1814)	30 grs.	32 grs.
	2. Flat pieces (from Curaçao in 1806)	36 grs.	5 grs.

Goebel and Kirst found 56 grs. of Quinia, and 43 grs. of pure Cinchonia.

The bark analyzed, under the name of *Carthagena Cinchona*, by Pelletier and Caventou (*Journ. de Pharm.* vii. 101) was *Carthagena brown Cinchona* (Guibourt, *Hist. des Drog.* ii. 96). The constituents were similar to those of *red cinchona.* The resinoid matter was very abundant.

Cryptogamia.—Very few cryptogamia are found on this bark. The following are those mentioned by Bergen:—

Lichenes.—*Trypethelium variolosum; Thelotrema bahianum; Pyrenula porinoides; P. discolor; Parmelia melanoleuca; Usnea florida δ Cinchonæ.*

2. *Cinchona de Carthagena fibrosa.—Carthagena Fibrous Cinchona.*

Synonymes.—*Quinquina de Colombie ligneux*, Guibourt. *China flava fibrosa; Holzige gelbe China*, Bergen.

History.—This bark is not distinguished in commerce from the preceding, and its history, therefore, cannot be traced separately.

It is uncertain at what period Carthagena Cinchona was introduced into commerce. It may have been contemporaneous with the Calisaya bark. Von Bergen says it was first met with at public sales in the year 1805.

Botany.—The origin of Carthagena fibrous bark is not accurately ascertained. As it is imported in the same parcel with the Carthagena hard Cinchona—as both barks appear in commerce together, and closely resemble each other—I suspect they are obtained from the same species, either at different seasons or in different localities.

Commerce.—As the preceding kind.

Essential Character.—*Coat* thin, soft, of moderate thickness,—or rubbed off; *under-surface* even, but rough to the touch; *colour* pure ochre-yellow (Bergen).

Description.—The dimensions of the quills and flat pieces, as well as their form, and the appearance of their epidermis, agree with those of the last-mentioned cinchona. The coat is wholly or partially absent, especially in the flat pieces. The rete mucosum is corky, and somewhat soft. Though apparently smooth, the under surface is to the touch finely splintery. The prevailing tint of the cortical layers is ochre-yellow. The very fibrous and splintery fracture (both longitudinal and transverse) especially distinguishes this kind. The taste is at first woody and insipid, then somewhat bitter and astringent. The powder is between cinnamon and ochre-yellow.

Commercial Varieties.—In commerce this and the last-mentioned Cinchona are confounded.

The *Quinquina Pitaya, Quinquina de la Colombie* ou *d'Antioquia* of Guibourt, is closely allied to, if indeed it be not identical with, this bark.

Composition.—No complete analysis of this bark has yet been made. The following are the quantities of the cinchona alkalies obtained by Von Santen, and by Goebel and Kirst:—

	1 *lb. of Bark.*	*Cinchonia.*	*Sulphate of Quinia.*
Von Santen	1. Middling fine quills (from Cadiz in 1819)..	20 grs.	11 grs.
	2. Flat pieces (from ditto)	32 grs.	15 grs.
	3. Ditto (from Curaçao in 1806)	30 grs.	25 grs.
	4. Ditto, thicker (from ditto)	34 grs.	30 grs.
	5. Ditto, uncoated (from ditto)	——	30 grs.

Goebel and Kirst obtained 54 grs. of pure *Quinia*, but could detect no cinchonia.

Cryptogamia.—Very few cryptogamic plants are found on this bark. The following are mentioned by Von Bergen (*Monogr.* S. 297):—

Lichenes.—Thelotrema bahianum; Pyrenula porinoides; P. discolor; Parmelia melanoleuca; and *Usnea florida* δ *Cinchonæ.*

3. *Cinchona de Cusco.—Cusco Cinchona.*

This bark was described in 1830 by Guibourt (*Journ. de Chim. Méd.* vi. 353). The flat uncoated pieces may, by inexperienced persons, be mistaken for yellow (Calisaya) bark: but they may be distinguished by sulphate of soda not producing any precipitate in their infusion, whereas it causes a precipitate with the infusion of the yellow (Calisaya) bark. The middling, and smaller pieces and quills are in general partially or wholly covered with a whitish, smooth, uncracked epidermis. The rete mucosum is orange-red, and corky. The colour of the inner surface is yellowish cinnamon-brown. Touched by nitric acid, both rete mucosum and cortical layers become of a deeper colour. The only vegetable alkali which Guibourt obtained from Cusco cinchona was cinchonia (about ʒj. from a pound of bark). The red cinchonia was present in abundance.

Guibourt considers this bark to be identical with the *Arica Bark* (*E'corce d'Arica*) of Pelletier and Coriol (*Journ. de Pharm.* xv. 565). But Arica bark is said to become green on the application of nitric acid, and to yield a peculiar alkali termed *aricina.* In 1830, I procured from M. Pelletier a cinchona which he called Arica bark: it is paler than the Cusco cinchona of Guibourt; but, like the latter, is not rendered green by nitric acid.

The *China rubiginosa* of Bergen (*Pharm. Central-Blatt. für* 1830, 121) is said to resemble Carthagena fibrous bark. Guibourt says it is identical with his Cusco cinchona.

4. *Cinchona aurantiaca de Santa Fe.—Orange Cinchona of Santa Fé.*

(Bark of *Cinchona lancifolia*).

This bark was formerly described by Guibourt as *Carthagena spongy bark* (*Quinquina de Cathagène spongieux*). I have once met with it in England under the name of *new spurious yellow bark*. It was unsaleable, and in a warehouse at the London Docks. Its origin was unknown until Guibourt found a specimen of it at the Muséum d'Histoire Naturelle of Paris, where it had been deposited by Humboldt as the *orange cinchona* of Mutis (*Cinchona lancifolia*). The cortical layers are excessively fibrous, very slightly bitter, in some pieces almost insipid, and of an orange colour. The largest pieces are semi-cylindrical, 4 or 5 inches broad, $\frac{3}{4}$ of an inch thick, above 12 inches long, covered in places with a yellowish-white, smooth, micaceous epidermis, presenting on the outer surface longitudinal cracks. The smaller pieces are an inch and a half broad, and are rough externally from the numerous short cracks (longitudinal and transverse) of the epidermis. Guibourt says, that the epidermis is not cracked, but this statement does not accord with my specimens. Some small quills which I received from celebrated pharmacologists are tolerably smooth. The orange cinchona of Santa Fé is of little medicinal virtue, though Mutis declared it to be of great value ; and his opinions and errors on this and some other topics have unfortunately been adopted by Humboldt. The following observation of this celebrated traveller shows the just estimate formed by, not the ignorance of, the Spanish authorities respecting the value of this bark. "The effect of mercantile cunning went so far, that, at the royal command, a quantity of *the best orange-coloured cinchona bark*, from New Grenada, which M. Mutis had caused to be peeled at the expense of the king, was burned, as a decidedly inefficacious remedy, at a time when all the Spanish field-hospitals were in the greatest want of this valuable product of South America" (Humboldt in Lambert's *Illustr.* p 33). Soubeiran (*Traité de Pharm.* i. 603) says, 1 lb. of *spongy Carthagena Cinchona* (*Quinquina de Carthagène spongieux*) yields from 24 to 36 grains of sulphate of cinchonia ; but I suspect he does not allude to this bark.

γ. *Red Cinchona Barks, with a whitish Epidermis.*

1. *Cinchona nova.—Mutis's Red Cinchona of Santa Fé.*

(Bark of *Cinchona magnifolia.*)

This bark is the *Kina nova*, or *Quinquina nova* of the French pharmacologists. The evidence on which it is referred to C. magnifolia has been already stated (see p. 987). I have only once met with this bark in London. It had been sent, mixed with several other barks, to a drug-mill to be ground to powder. It scarcely resembles any other cinchona barks with which I am acquainted. Guibourt thus describes it (*Hist. des Drog.* ii. 99):—" Bark about a foot long, quilled when small, open or almost flat when larger, having, in general, a perfectly cylindrical form, whence its name of *candle cinchona* (*quinquina chandelle*). Its epidermis is whitish, thin, smooth, and has scarcely any cryptogamia (one has the form of yellow, waxy, mamellated plates), without any other fissures than some transverse rents, which extend to the liber, and appear to be the effect of desiccation ; whereas the circular impression of quilled yellow cinchona, for example, depends on the organization of the bark. Sometimes the epidermis is wanting. The cortex, properly so called, is from one to three lines thick*, of a pale carnation-red, which becomes deeper in the air, especially at the outer surface, which, when it is deprived of epidermis, is always brownish-red ; its fracture is foliated externally, shortly fibrous internally; and when examined by a lens, we observe, between the fibres, and especially between the laminæ, a great abundance of two granular matters, one red, the other whitish, and which give the roseate colour above stated. Some pieces present in their fracture, and nearer the external than the internal edge, a yellow, transparent exudation, like resin or gum. The bark has an unpleasant astringent taste, analogous to that of tan : its odour is feeble and intermediate between that of tan and gray cinchona. The powder is fibrous, and very decidedly red." Pelletier and Caventou

* The bark of the trunk is five or six lines thick, covered with a white, friable, unequal, cracked epidermis : in other respects it resembles that of the branches.

(*Journ. de Pharm.* vii. 109) analyzed it, and found a *fatty matter, a peculiar acid (kinovic acid), a red resinoid matter, gum, starch, yellow colouring matter, alkalescent matter* in small quantity, and *lignin.*

2. *Red Cinchona, with a white micaceous Epidermis.*

Under this name Guibourt designates a red bark having a white micaceous epidermis, and which I have found intermixed with the red bark of commerce.

DIVISION II. FALSE CINCHONA BARKS, (*Cinchonæ falsæ*). — Under this division are placed those barks which have been introduced into commerce as Cinchonas, but which are not obtained from any species of *Cinchona* (Decandolle). Their physical characters are for the most part very different from those of the genuine: moreover, they are not known to contain quinia, cinchonia, or aricina.

With the exception of *Pitaya Cinchona,* I have never met with any of them in English commerce. The following are those best known:—

1. CINCHONA DE SANCTA LUCIA; *St. Lucia Bark; Quinquina Piton,* or *Q. de Sainte Lucie,* Guibourt; Bark of *Exostema floribundum,* a native of the West India islands.—Its bitter principle is called *Montanin.*
2. CINCHONA CARIBÆA; *Caribæan* or *Jamaica Bark; Quinquina caraïbe,* Guibourt; Bark of *Exostema caribæum,* a native of most of the West India Islands and Mexico.
3. CINCHONA [FALSA] PERUVIANA; *Peruvian* [false] *Cinchona; Écorce de Exostemma du Pérou,* Guibourt; Bark of *Exostema peruvianum,* a native of the colder parts of Peru, between the river Chota and the village of Querocotillo.
4. CINCHONA BRASILIANA; *Brazilian Cinchona; Écorce d'Exostemusa du Brésil,* Guibourt; *Quinquina de Piauhi;* Bark of *Exostema Souzanum,* a native of Brazil. —It yields an organic alkali, called *Esenbeckina.*
5. CINCHONA PITAYA; *Pitaya Cinchona; Quinquina bicolore,* Guibourt; bark of an unascertained tree [*Exostema? Malanea racemosa?*].—It has been analyzed by MM. Folchi and Peretti, who discovered a new alkaline principle in it, which they have termed *Pitaina.*

*** The *Californian Cinchona (Cinchona California),* the *Cinchona de Rio Janeiro* (Bark of *Buena hexandra?*), and the *Quina de Serra* (bark of a species of *Remijia*) described by some pharmacologists, I am unacquainted with.

COMPOSITION.—In February 1791, Fourcroy (*Ann. de Chim.* viii. 113 and ix. 13) published an analysis of *St. Lucia Bark* (formerly called *St. Domingo Bark*), which was long regarded as a model of vegetable analysis. In 1802, Seguin (*Ann. de Chim.* xcii. 121; and xciii. 273 and 304) concluded, that as the active principle of cinchona was precipitated by an infusion of nutgalls, it must be gelatine, and therefore, proposed and employed the use of clarified glue as a febrifuge in intermittents. In 1803, Dr. Duncan, jun. (*Nicholson's Journal,* vi. 225) shewed that the active principle could not be gelatine, but must be a substance *sui generis,* which he, therefore, termed *cinchonia.* In 1806, Vauquelin (*Ann. de Chim.* lix. 113) published some experiments on seventeen kinds of cinchona. In 1810, Gomes (*Mem. da Acad. Real das Sciencias de Lisboa,* iii. 201; and *Ed. Med. and Surg. Journ.* vii. 420) succeeded in isolating *cinchonia,* and obtaining it in a crystalline form. In 1820, Pelletier and Caventou (*Journ. de Pharm.* vii. 49) announced the existence of two organic alkalies, *cinchonia* and *quinia,* in cinchona bark. In 1829, Pelletier and Coriol (*Ibid.* xv. 565) discovered a third alkali, *aricina,* in a new kind of cinchona bark.

The preceding are the most important epochs in the chemical history of the cinchona barks.

The constituents of *pale* (Loxa?), *yellow*, and *red cinchona*, are, according to Pelletier and Caventou, the following:—

	Pale Cinchona.	*Yellow Cinchona.*	*Red Cinchona.*
1. Kinate of cinchonia	+	+	+
2. ——— quinia	+	+	+
3. Soluble red colouring matter (*tannin*)	+	+	+
4. Insoluble ditto (*red cinchonic*)	+	+	+
5. Yellow colouring matter	+	+	+
6. Green fatty matter	+	+	+
7. Kinate of lime	+	+	+
8. Starch	+	+	+
9. Gum	+	0	0
10. Lignin	+	+	+

The following are the *chemical classifications* of cinchona barks, according to Goebel (*Pharm. Waarenk.* i. 106), Geiger (*Handb. d. Pharm.* ii. 540), and Pfaff (Bergen, *Monogr.* 337), before (p. 978) referred to:—

Goebel's Classification.	*Quantity of alkalies in a lb. of Bark.* Cinchonia	Quinia.
I. *Cinchona barks containing cinchonia:—*		
(*a.*) Huanuco, or gray bark	168 grs.	..
II. *Cinchona barks containing quinia:—*		
1. Yellow, or regia bark ..		
(*a.*) Flat uncoated pieces	..	95 grs.
(*b.*) Coated thick quills	..	84
(*c.*) Thin quills	..	60
2. Fibrous Carthagena bark (China flava fibrosa)	..	54
3. Ash bark (*China Jaen*)	..	12
III. *Cinchona barks containing both quinia and cinchonia:—*		
1. Red bark	65	40
2. Hard Carthagena bark (China flava dura)	43	56
3. Brown, or Huamalies bark	38	28
4. True Loxa or Crown bark	20	16
5. False Loxa bark	12	9
IV. *False Cinchona barks*	0	0

Geiger's Classification.

DIV. 1.—*Cinchona barks, in which Cinchonia predominates.* This includes the Huanuco, Huamalies, Ash, Loxa, and false Loxa barks.

DIV. 2.—*Cinchona barks, in which Quinia prevails.* This includes the Regia or Yellow bark only.

DIV. 3.—*Cinchona barks, in which Quinia and Cinchonia are contained in nearly the same stochiometrical proportions.* Here are placed the Red and Carthagena barks.

Pfaff's Classification of the Cinchona Barks according to their chemical affinities.

Cinchona Huanuco. Cinchona Huamilies. Cinchona rubra.	Cinchona Carthagena.	Cinchona regia. Cinchona de Loxa. Cinchona falsa de Loxa.

1. *Volatile Oil of Cinchona* (*Odorous, Aromatic,* or *Balsamic Principle*).—This was procured first by Fabbroni, (*Berl. Jahrb.* 1807) afterwards by Trommsdorf (*Journ. d. Pharm.* xxv.) It was obtained by submitting bark with water to distillation. The distilled water had the peculiar odour of the bark, and a bitterish acrid taste. The oil which floated on the water was thick and butyraceous, and had the peculiar odour of the bark, and an acrid taste. Zenneck (*Pharm. Central-Blatt. für* 1832, S. 236) says the cinchona odour is imitated by a solution of turmeric in potash, as well as by chloride of iron.

2. *Tannic Acid* (*Astringent Principle; Soluble Red Colouring Matter*).—This is a constituent of the most valuable kinds of cinchona. Its presence in an infusion of bark is detected by the ferruginous salts, by a solution of emetic tartar, and by a solution of gelatine: the first produces a green colour or precipitate (*tannate of iron*), the second causes a whitish precipitate (*tannate of antimony*), the third also a whitish precipitate (*tannate of gelatine*). According to Pfaff (*Syst. d. Mat. Med.* ii. 247, and vii. 126; Bergen, *Monogr.* S. 338) there is another principle in cinchona barks (*resin*, Bucholz) which forms a precipitate with emetic tartar; for the quantity of precipitate produced by this salt bears no ratio to that occasioned by the solution of gelatine; in some barks being more, in others less. Cinchona tannin is remarkable for the extreme facility with which its solution absorbs oxygen, and becomes coloured when exposed to the air, especially under the influence of alkalies. The red insoluble matter which is formed is, according to Berzelius (*Traité de Chim.* v. 585), *red cinchonic*. The combinations of cinchona tannin with acids are more soluble than those of nutgall tannin.

3. *Red Cinchonic* (*Insoluble Red Colouring Matter*).—This substance is considered by Berzelius (*op. cit.*) to be a product of tannin altered by the air, and to consist of tannin and apothême. It is inodorous, insipid, and of a reddish brown colour. It is insoluble, or nearly so, in cold water, but is somewhat more soluble in boiling water. Acids favour its solution in water. It is soluble in alcohol (especially when hot) but scarcely so in ether. Its aqueous solution has not, either with or without an acid, the power of forming a precipitate with a solution of gelatine, but it has with emetic tartar. If, however, red cinchonic be dissolved in an alkaline solution, and then precipitated by an acid, it acquires the power of precipitating gelatine. But if it be heated with a solution of potash or soda, it loses the power of precipitating gelatine. Before the blow-pipe red cinchonic conducts itself as an animal substance (*Pharm. Centr.-Blatt. für* 1832, S. 391).

4. *Kinic, Cinchonic*, or *Quinic Acid.*—This acid is not peculiar to the cinchona barks, being also found, according to Berzelius, in the alburnum of *Abies communis*. As met with in commerce, kinic acid is in the form of a thick syrupy liquid, which may be crystallized, though with difficulty. It is soluble both in water and alcohol, and has an acid taste. When heated in closed vessels, it is decomposed,—*pyrokinic* acid is formed,—and an odour of caramel evolved (like that of sugar or tartaric acid, when heated). Sulphuric acid dissolves it, acquires a green tint, and by the aid of heat, carbonizes it. It does not precipitate the calcareous salts, nitrate of silver, or the neutral acetate of lead; but it precipitates the diacetate of lead. In the solubility of its combinations it is analogous to acetic acid, from which it is distinguished by its crystallizability, and its not volatilizing unchanged. The *Kinates* are analogous to the acetates in their solubility in water: they are insoluble in pure alcohol. When dried, they have a gummy appearance; and when decomposed by heat, evolve an odour of caramel. *Pyrokinic acid* does not precipitate the alkalies, lime, or barytes; it precipitates the salts of lead and silver; and lastly, it gives a beautiful green colour to the salts of iron. Kinic acid consists, according to Liebig, of $C^{15}\ H^{9}\ O^{9}$: its atomic weight, therefore, is 171. Baup represents its composition to be $C^{15}\ H^{10}\ O^{10}$, which is identical with that of lignin, according to Prout.

5. *Kinovic Acid.*—This acid was discovered by Pelletier and Caventou in Cinchona nova (see p. 991). It has considerable analogy to stearic acid. It is a brilliant white, light substance, very little soluble in water, but readily dissolved by alcohol and ether. A solution of *kinovate* of magnesia forms precipitates (*kinovates*) with solutions of acetate of lead, bichloride of mercury, and the salts of cinchonia.

6. *Cinchona Alkalies* (*Cinchonia, Quinia*, and *Aricina*).—It appears from the observations of Henry and Plisson (*Journ. de Pharm.* xiii. 269 and 369) that cinchonia and quinia exist in cinchona bark in combination with kinic acid, and also with red cinchonic. The quantities of cinchonia and quinia yielded by some cinchona barks is thus stated by Soubeiran (*Traité de Pharm.* i. 603) and by Von Santen (Bergen, *Monograph.* Pl.),—Goebel's table has been already (p. 993) given,—:

According to Soubeiran.

One French lb. (7561 grs. Troy).	*Troy Grains.*
1. Uncoated Yellow (Calisaya) Bark	202 to 218 grs. of Sulphate of Quinia.
2. Coated Yellow (Calisaya) Bark	177 grs. of ditto.
3. Loxa Bark	88½ to 118 grs. of Sulphate of Cinchonia.
4. Gray (Lima) Bark	88½ grs. of ditto.
5. Deep Red Bark	118 grs. of Sulphate of Quinia, and 59 grs. of Sulphate of Cinchonia.
6. Pale Red Bark	88½ grs. of Sulphate of Quinia, and 59 grs. of Sulphate of Cinchonia.
7. Spongy Carthagena Bark ..	19½ to 29½ grs. of Sulphate of Cinchonia.

According to Von Santen.

One lb. (*Apoth. Weight*).	*Apoth. Grains.*
1. Coated Yellow (Calisaya) Bark	160 grs. of Sulphate of Quinia, and 2 grs. of pure Cinchonia.
2. Loxa Bark	53⅓ grs. of Sulph of Quinia.
3. Gray (Huanuco) Bark......	210 grs. of pure Cinchonia.
4. Red Bark	184 grs. of pure Cinchonia, & 9 grs. of Sulphate of Quinia.
5. Hard Carthagena Bark	30 grs. of pure Cinchonia, & 32 grs. of Sulphate of Quinia.
6. Fibrous Carthagena Bark ..	34 grs. of pure Cinchonia, & 30 grs. of Sulphate of Quinia.
7. Huamalies Bark	95 grs. of pure Cinchonia.
8. Ash-Cinchona Bark	1 gr. of Gallate of Quinia.
9. False Loxa Bark	0

Cinchonia and quinia possess the following properties: when burned with nitrate of ammonia they leave no mineral, earthy, or alkaline residuum. Their alkaline nature is shown by their restoring the blue colour of reddened litmus. An iodate and hydriodate are formed when iodine and water is mixed with cinchonia or quinia. Nitric acid does colour either of these alkalies: hence they are distinguished from morphia, brucia, and commercial strychnia. When a solution of the nitrate of either cinchonia or quinia is concentrated, the anhydrous nitrate separates under the form of oleaginous drops, which solidify on cooling, and, if covered with water, absorb this fluid, and become covered in a few days with groups of crystals. Solutions of the salts of cinchonia and quinia form precipitates on the addition of ammonia, ferrocyanide of potassium, tincture of nutgalls, oxalate of ammonia, and tartrate of potash. Cinchonia, quinia, and aricina, may be regarded as oxides of a common base (composed of $C^{20} H^{12} N$), which has been termed *quinogen.*

1 atom Quinogen	=	146	1 atom Quinogen	=	146	1 atom Quinogen	=	146
1 atom Oxygen	=	8	2 atoms Oxygen	=	16	3 atoms Oxygen	=	24
1 atom Cinchonia	=	154	1 Quinia		162	1 Aricina		170

According to this hypothetical view *cinchonia* is a *monoxide, quinia* a *binoxide*, and *aricina* a *teroxide.*

a. Quinia (*Quina; Quinine; Quinina; Quininum*).—The simplest, readiest, and cheapest mode of procuring it, is by precipitating a solution of the disulphate of quinia by ammonia, and collecting and drying the precipitate. Pelletier crystallized it by dissolving it in alcohol of sp. gr. 0·815, and setting the solution aside to evaporate spontaneously in a dry place.

Pure quinia is white, inodorous, very bitter, and fusible at about 300° F. The fused quinia when cold is yellow, translucent, friable, and somewhat like resin. Boiling water dissolves 1-200th of its weight of quinia: cold water dissolves a much less quantity. It is readily soluble in alcohol (especially when hot), and in ether. *Crystallized quinia* is a hydrate of quinia, and contains one equivalent of water. The *salts of quinia* are readily crystallizable, very bitter, and have a pearly aspect. They are, for the most part, soluble in water, alcohol, and ether. The *oxalate, tartrate, tannate*, and *ferrocyanate*, are the less soluble salts. Tincture of nutgalls causes a precipitate (*tannate of quinia*) in a solution of a quinia sub- or neutral salt. Ammonia also produces a precipitate (*quinia*).

The following is the composition of quinia:—

	Eq.	*Eq. Wts.*	*Per Cent.*	*Liebig.*	*Pelletier & Dumas.*
Carbon	20	120	74·08	74·40	75·02
Hydrogen	12	12	7·40	7·61	6·66
Nitrogen	1	14	8·64	8·11	8·45
Oxygen	2	16	9·88	9·88	10·43
Anhydrous Quinia	1	162	100·00	100·00	100 56

Disulphate of Quinia; Quinæ Disulphas, L. E. (*Subsulphate of Quinia; Sulphate of Quinine*, offic.)—The *preparation* and *adulteration* of this salt are described at p. 1012-15. This salt occurs in small fibrous, odourless, very bitter crystals, which have a pearly aspect, and a flexibility like amianthus. Exposed to the air, they effloresce slightly. When heated they become luminous; friction promotes this phosphorescence. At 240° F. they melt like wax; at a more elevated temperature the salt assumes a fine red colour; and when ignited in the air burns, leaving at first a carbonaceous residuum, but which is subsequently dissipated. One part of this salt requires 80 parts of cold alcohol (sp. gr. 0·850), or 740 parts of cold, or 30 parts of boiling water, to dissolve it: as the saturated solution cools, part of the salt separates. A remarkable property of the salt is to give a blue tinge to water. The following is the composition of this salt:—

	Eq.	*Eq. Wt.*	*Per Cent.*
Sulphuric Acid	1	40	9·17
Quinia	2	324	74·31
Water	8	72	16·52
Crystallized Disulphate of Quinia	1	436	100·00

By exposure to the air the crystals lose four (Soubeiran says six) equivalents of water,—equal to about eight per cent. When fused they evolve two more equivalents. 100 grs. of the crystals dissolved in water, acidulated with hydrochloric acid, yield by the addition of chloride of barium a quantity of sulphate of barytes, which when ignited weighs 26.6 grs. If chlorine gas or a solution of chlorine be added to an aqueous solution of the salt, and afterwards ammonia, an emerald-green colour is produced (Roper, *Lond. Med. Gaz.* xi. 320; Meeson, *Phil. Mag.* Feb. 1835; André, *Journ. de Pharm.* xxii. 127).

Monosulphate of Quinia; Neutral Sulphate of Quinia.—This salt is readily formed by adding sulphuric acid to the disulphate. It is sometimes produced in the manufacture of the latter salt, and remains, on account of its greater solubility, in the mother liquor, with the sulphate of cinchonia. It is also produced when we dissolve the disulphate in an aqueous liquid acidulated with sulphuric acid. This salt crystallizes in square prisms. It reddens litmus, but is not acid to the taste. It is soluble in 22 parts of water at 55° F., or 11 parts at 73° F. It is also soluble in alcohol. It is composed of—

	Eq.		*Eq. Wt.*		*Per Cent.*
Sulphuric Acid	1	....	40	....	14·6
Quinia	1	....	162	....	59·1
Water	8	....	72	....	26·3
Crystallized Sulphate of Quinia	1	....	274	....	100·0

The *Native Kinate of Quinia* is crystalline, very bitter, slightly soluble in alcohol, but very soluble in water. It is decomposed by ammonia, potash, or lime water, the products being quinia and the kinate of ammonia, of potash, or of lime. The salts of lead and of silver slightly acidulated, do not produce with it any apparent precipitate.

The *Native Compound of Red Cinchonic and Quinia* is bitter, scarcely soluble in cold water, but more so in boiling water; the liquor becomes turbid as it cools. Acids promote its solution in water. It is readily soluble in alcohol. Alkalies decompose it, and precipitate the quinia.

β. Cinchonia (*Cinchonine; Cinchonina; Cinchonium*).—Obtained by precipitation from a salt of Cinchonia by ammonia. It crystallizes with facility from its alcoholic solution. *Crystallized Cinchonia* is anhydrous, colourless, inodorous, and bitter. The form of the crystals is a four-sided prism, with oblique, terminal facets. When heated this salt does not fuse until it begins to decompose: it then fuses, furnishes a crystalline sublimate (cinchonia?), gives out ammonia, and leaves a carbonaceous residuum. It is soluble in 2,500 parts of cold water, and in a somewhat less quantity of boiling water: the hot solution becomes opaque as it cools. It is soluble in alcohol, especially when hot: from the solution on cooling crystals are obtained. Its solubility in alcohol is, however, less than that of quinia in this fluid. It is soluble in ether, but much less than in alcohol. It dissolves, though slightly, in fixed oils, somewhat more so in oil of turpentine, and readily in dilute acids.

Disulphate of Cinchonia; Cinchoniæ Disulphas (*Subsulphate of Cinchonia*).—Its crystals are short, oblique prisms, terminated by bihedral summits. Its taste is bitter. When heated it becomes phophorescent: at 212° F. it fuses; at 248° F. it loses its water of crystallization. It is soluble in 6 parts of alcohol of sp. gr. 0·85, and in 11 parts of absolute alcohol. It requires 54 parts of cold water to dissolve it. The following is its composition:—

	Eq.		*Eq. Wt.*		*Per Cent.*
Sulphuric Acid	1	....	40	....	10·42
Cinchonia	2	....	308	....	80·20
Water	4	....	36	....	9·38
Crystallized Disulphate of Cinchonia	1	....	384	....	100·00

This salt has been frequently employed in medicine under the name of *sulphate of cinchonia.*

Neutral Sulphate of Cinchonia is not employed in medicine. It is prepared by adding sulphuric acid to a solution of the disulphate. The crystals contain eight atoms of water of crystallization. They are much more soluble than those of the disulphate.

The *Native Kinate of Cinchonia* possesses similar properties to the native kinate of quinia; but ammonia produces with it a less flocculent precipitate, and which dissolves in alcohol, and is susceptible of crystallization.

Comparative Table of some distinguishing properties of Cinchonia and Quinia.

		Cinchonia.	Quinia.
Form		Crystalline.	Amorphous (in the anhydrous state). The hydrate is crystallizable, but with difficulty.
Taste		Bitter.	Very bitter.
Fusibility		Infusible when quite dry; when moist fuses, but at the same time decomposes.	Fusible.
Composition		One atom contains only one atom of oxygen.	One atom contains two atoms of oxygen.
Combining proportion, or atomic weight		154	162
Solubility	in water	Dissolves in 2500 times its weight of boiling water.	Dissolves in 200 times its weight of boiling water.
	in alcohol	Soluble; solution readily crystallizes.	More soluble than cinchonia; solution with difficulty crystallizes.
	in ether	Sparingly soluble; solution readily crystallizes.	Very soluble; solution crystallizes with difficulty.
Salts. *Disulphate*	form and aspect	Four-sided prisms.	Pearly silky needles.
	solubility	Soluble in 54 parts of cold water or 6 parts of spirit (sp. gr. 0·85).	Soluble in 740 parts of cold water or 80 parts of spirit (sp. gr. 0·85).
Neutral Sulphate		Soluble in half its weight of cold water or one part of cold spirit (sp. gr. 0·85).	Soluble in 11 parts of cold water. More soluble in spirit than sulphate of cinchonia.
Hydrochlorate		Crystallizes in needles.	Crystallizes in silky or pearly tufts.
Phosphate		Scarcely crystallizable; aspect gummy.	Crystallizes in pearly needles.
Arseniate		Scarcely crystallizable.	Crystallizes in prismatic needles.
Acetate		Very soluble; crystals small and granular.	Less soluble; crystals in silky tufts, grouped in stars, &c.
The solution of *disulphate* treated by chlorine, then by ammonia, yields		A reddish solution.	An emerald-green solution.

γ. *Aricina: Cusco-cinchonia; Cusconin.*—Discovered in *Arica* or *Cusco-Cinchona* by Pelletier and Coriol in 1829. It was procured from this bark by the same process that quinia is extracted from yellow bark. It is a white crystallizable substance, analogous to cinchonia in many of its properties, but is distinguished by its acquiring a green tint by the action of nitric acid, and by a boiling saturated solution of the *sulphate* forming, as it cools, a tremulous jelly, which by desiccation becomes horny. It consists of—

	Eq.	*Eq. Wt.*	*Per Cent.*
Carbon	20	120	70·59
Hydrogen	12	12	7·06
Nitrogen	1	14	8·23
Oxygen	3	24	14·12
Aricina	1	170	100·00

*** Several other alkaloids have been said to exist in the Cinchona barks; but further evidence is required to establish their existence. Dr. Mills (*Quart. Journ. of Science* for April 1828, p. 379) has given the name of *Blanquinine* to a supposed new alkaloid in Cinchona blanca (*C. ovalifolia*). The *Chinoïdine* of Sertuerner (*Journ. de Pharm.* xvi. 44) is, according to Henry fils and Delondre (*Ibid.* 144), merely a mixture of quinia and cinchonia with yellow colouring matter. The *alkalescent matter of Cinchona nova* (see p. 992) requires further examination. The *alkaloids of the false Cinchona barks* have been already (p. 992) referred to.

Chemical Characteristics.—The most important chemical characteristics of the cinchona barks are those derived from the action of the following reagents on infusions of bark: *tincture of nutgalls*, *emetic tartar*, *gelatine*, *sulphate of iron*, and *neutral oxalate of ammonia*. The first is a test for the alkaloids, the three following for tannic acid, and the last for lime. Tables of the changes produced by these and other tests have been published by Vauquelin (*Ann. de Chim.* lix. 113), Von

Santen (Bergen, *Monogr.*), Guibourt (*Hist. des Drog.* ii.), and Martius (*Pharmakogn.* 126). The following table is from the last mentioned pharmacologist:—

Cold Infusion, (prepared by digesting for 30 hrs. 1 part of bark in 32 of water).	*Emetic Tartar.*	*Gelatine.*	*Neutral Oxalate of Ammonia.*	*Tincture of nutgalls.*	*Sulphate of iron.*
1. HARD CARTHAGENA BARK..	Unchanged	Unchanged	Turbidness	Strong, yellowish-white turbidness	Slight yellowish-white turbidness.
2. FIBROUS CARTHAGENA BARK	Unchanged	Unchng'd	Slight turbidness	Ditto	Colour yellowish.
3. HUAMALIES BARK........	Slight turbidness	Unchng'd	Slight turbidness	Ditto	Colour greenish-yellow.
4. HUANUCO BARK	Unchanged	Unchng'd	Scarcely changed	Very slight turbidness	Dirty brownish-green turbidness.
5. ASH CINCHONA	Unchanged	Unchanged	Turbidness ..	Turbidness ..	Not changed.
6. LOXA BARK	Strong flocculent white turbidness	Slight flocculent turbidness	Very strong yellowish-white turbidness	Very strong yellowish-white turbidness	Dirty blueish-green turbidness.
7. FALSE LOXA BARK..........	Unchanged	Unchanged	Turbidness ..	Turbidness ..	Not changed.
8. YELLOW (CALISAYA) BARK..	Turbidness	Unch'd [?]	Slight turbidness ..	Strong flocculent white turbidness	Slight dirty-violet turbidness.
9. RED BARK	Unchanged	Unchanged	Turbidness ..	Ditto	Coarsely flocculent, slight dirty-violet turbidness.
10. CINCHONA RUBIGINOSA	Cloudy	Unchanged	Turbidness ..	Ditto	Very slight turbidness.
11. CINCHONA NOVA	Unchng'd	Flocculent turbidness	Extremely slight turbidness	Unchanged	Dirty greenish-brown turbidness.

The barks may be arranged, after Vauquelin, in three sets :—

1st. Those whose infusions precipitate infusion of nutgalls, but not a solution of gelatine: ex. *Carthagena barks.* These contain the alkalies, but no tannic acid.

2. Those whose infusions precipitate a solution of gelatine, but not an infusion of nutgalls: ex. *Cinchona nova.* These contain tannic acid, but no appreciable quantity of cinchonia or quinia.

3. Those whose infusions precipitate both a solution of gelatine and an infusion of nutgalls: ex. *Loxa Bark.* These contain both alkalies and tannic acid.

CHEMICAL CHARACTERISTICS OF THE GOODNESS OF CINCHONA BARKS. —The best cinchona barks are those which contain, in the greatest abundance, the vegetable alkalies and tannic acid. For, although the essential tonic operation of cinchona depends on the cinchonia and quinia, yet the astringency and part of the tonic effect arises from the tannic acid. "There exists a law in Sweden," says Berzelius (*Traité de Chim.* v. 587) "in virtue of which every cinchona bark imported into the country is tested by the infusion of galls, the persulphate of iron, a solution of gelatine, and emetic tartar; and it is proved by an experience of more than sixteen years, that the most efficacious bark is that which precipitates the most strongly a solution of gelatine and emetic tartar; in other words, that which contains the most tannin." Hence the chemical tests for good cinchona bark are twofold,—1st, those which detect the tannic acid, and 2ndly, those which detect the vegetable alkalies.

1. *TESTS FOR TANNIC ACID.*—These are three in number:—

1. *A solution of gelatine*, which occasions in infusion of cinchona a whitish precipitate (*tannate of gelatine*).
2. *A solution of a sesquiferruginous salt* (as persulphate of iron or sesquichloride of iron) which produces a green colour or precipitate (*tannate of iron*).

3. *A solution of emetic tartar*, which causes a dirty white precipitate (the nature of which has been before discussed, p. 993).

2. *Quinometry.*—Various alcaloïmetrical processes, applicable to the cinchona barks, have been recommended. They are essentially of two kinds: some consist in the use of certain reagents or tests which precipitate the alkaloids from an infusion of the bark,—others are processes for the extraction of the alkaloids, which are obtained either in the free state or as salts (disulphates).

1. Processes by tests.—α. *Tannic acid* is a very delicate test of the Cinchona alkalies, which it precipitates from their solutions, in the form of *tannates*. On this depends the value of infusion or tincture of nutgalls, employed as a test of the goodness of bark by Vauquelin (*op. supra cit.*), by Berzelius (*op. supra cit.*) and by O. Henry (*Journ. de Pharm.* xx. 429).

β. *Chloride of Platinum.*—Duflos's quinometrical method (*Pharm. Centr.-Blatt für* 1831, S. 537) is founded on the property of the cinchona alkalies to form with [neutral] chloride of platinum double salts (*platinum-chlorides of the alkaloids*) which are insoluble in alcohol, and very difficultly soluble in cold water. One grain of these salts dried in the air contains about ½ grain of the alkaloids.

γ. *Bichloride of Mercury.*—As bichloride of mercury forms with hydrochlorates of quinia and cinchonia, double salts (*mercury-bichlorides of the alkaloids*) which are only slightly soluble in water and in alcohol, it may perhaps be applicable, in some cases, as an alcaloïmetrical test.

2. Extraction of the Cinchona Alkalies.—The methods of extracting cinchonia and quinia from bark for alkaloïmetrical purposes are various. They may be referred to under four divisions:—

α. *By Alcohol.*—Some chemists begin by preparing an alcoholic tincture of bark, without using in the first instance either acid or mineral alkali. This is the method adopted by Pelletier and Caventou (*Journ. de Pharm.* vii. 52), by Tilloy (*Ibid.* xiii. 530), and by Bonnet (*Pharm. Central-Blatt für* 1832, S. 900). From this tincture the alkaloids may be extracted by various processes.

β. *By Acidulated Liquids, without the previous use of alkaline solutions.*—In some alkaloïmetrical processes the bark is digested in spirit, acidulated with sulphuric or hydrochloric acid: as in those of Henry fils (*Journ. de Pharm.* xvi. 754), and Stoltze (*Pharm. Central-Blatt für* 1832, S. 896). In others acidulated water is used, as in the methods of Von Santen (Bergen, *Monogr.* 343), Henry and Plisson (*Journ. de Pharm.* xiii. 270), and Winkler (*Pharm. Central-Blatt für* 1835, S. 509).

γ. *By Acidulated Liquors, after the use of alkaline solutions.*—Scharlau's method (*Pharm. Central-Blatt für* 1832, S. 487) is founded on the property of red cinchonic and cinchona-tannin (with both of which the cinchona-alkaloids are combined) to dissolve in caustic alkalies, and thereby to be extracted from the bark: the cinchonia and quinia which are left behind may be subsequently removed by an acidulated liquor. Badollier (Dumas, *Traité de Chem.* v. 745) also employed caustic potash; Stoltze (*Ibid.* 746) a mixture of lime and water. In the process of the *Edinburgh pharmacopœia* for the manufacture of disulphate of quinia an alkaline carbonate (carbonate of soda) is used.

δ. *By Water.*—The *Edinburgh pharmacopœia* gives the following directions for ascertaining the good quality of yellow bark. "A filtered decoction of 100 grains in two fluid ounces of distilled water gives, with a fluid ounce of concentrated solution of carbonate of soda, a precipitate, which, when heated in the fluid, becomes a fused mass, weighing when cold 2 grains or more, and easily soluble in solution of oxalic acid." In this process the native salts of quinia extracted by the boiling water are decomposed by carbonate of soda, and carbonate of quinia precipitated. By heat the quinia fuses.

Of the above quinometrical processes I give the perference to that employed by the Edinburgh College in the manufacture of disulphate of quinia.

The separation of quinia and cinchonia, in order to estimate the quantity of each, is a matter of some importance. It is effected by the different degrees of solubility of these alkaloids or their salts, and by the easy crystallizability of cinchonia.

1. *Boiling Alcohol* may be employed to separate these alkaloids: when this liquid, charged with the two alkaloids, cools, the cinchonia crystallizes, but the quinia remains in the mother liquor. This mode of separation was adopted by Pelletier and Caventou (*Journ. de Pharm.* vii. 305).
2. *Ether* was used by Scharlau (*Pharm. Central Blatt. für* 1832, S. 488) as well as by others, to separate the two alkaloids: quinia is more soluble than cinchonia in this liquid.
3. *Disulphate of quinia is less soluble in water than disulphate of cinchonia*: hence, when these two salts have been dissolved in boiling water, the first crystallizes as the solution cools, while the disulphate of cinchonia remains in the mother liquor.

To manufacturers of disulphate of quinia it is of importance to have a ready means of estimating the quantity of quinia, as distinguished from cinchonia, which a bark yields. *Sulphate of Soda* is frequently used for this purpose. It has been found that the yellow (Calisaya) bark contains so much lime that an infusion (prepared by digesting for twenty-four hours one part of coarsely-powdered bark in sixteen parts of cold water) yields, on the addition of sulphate of soda, a white precipitate of sulphate of lime; whereas those barks (as the *pale* kinds) which are deficient in quinia give no precipitate with this salt. Guibourt (*Journ. de Chim. Méd.* ii. 624, 2nde Ser.) directs this test to be used thus: mix the powder of the bark with water, so as to form a thin paste; which is to be placed on a filter, and the filtered liquor tested with sulphate of soda (crystals).

Physiological Effects.—I. *Of the Cinchona Barks.*—The experiments of Dr. Adair Crawford (*Exp. Inquiry into the Effects of Tonics*, 1816) on the effects of tonics in promoting the cohesion of the animal tissues have been already (p. 80) referred to. He found that a kitten's intestines, which had been immersed in a thick mixture of cinchona bark and water, required a greater weight to break them than those immersed in water merely, in the ratio of 25·5 to 20·7. He found, moreover, that the same effect was produced on the blood-vessels and nerves; but an opposite effect on the skin, the cohesion of which it diminished in the ratio of 24·5 to 7·9. Hence he inferred that cinchona bark strengthened the alimentary canal, blood-vessels and nerves, but had a debilitating or relaxing effect on the skin. The error pervading these inferences has been already pointed out (see p. 80). Admitting that the dead animal tissues are invariably affected by cinchona in the way Dr. Crawford states, the conclusion that living tissues would be influenced in the same way is not supported by facts. Cold water relaxes dead, but corrugates living, animal tissues.

(*a.*) *On vegetables.*—Leaves of plants, immersed in an infusion of pale bark, were dried, but not contracted, in twenty-four hours (Decandolle, *Phys. Vég.* 1349).

(*b.*) *On animals generally.*—Dr. Freind (*Emmenol.* c. xiv.) states that an ounce and a half of a strong decoction of bark injected into the jugular vein of a dog, caused, in fifteen minutes, strong palpitations of the heart, and frequent spasms. Half an ounce more being injected, brought on tetanus and death. The blood was found after death liquid, the lungs red and turgid; the right ventricle was distended with blood, he left contained scarcely any. Rauschenbusch (quoted by Wibmer, *Wirk. d. Arzneim. ü. Gifte.* Bd. ii. 132) has also made experiments with Cinchona bark. In animals to whom he had given it for some days, he ound the stomach and alimentary canal contracted, and the coats thickened, but no traces of inflammation. The heart was firmer, the lungs covered with red spots, the liver yellowish, the bile watery and greenish. When the blood was exposed to the air, it remained dark coloured for a onger time than usual, was less coagulable, and the serum separated nore slowly: it appeared like that drawn in inflammatory cases. The pulse was stronger and fuller, the animal heat increased, and when the bark had been used for a long period, the muscles were pale, and their energy enfeebled. Some experiments on the effect of cinchona on the blood discs of frogs were made by Leeuwenhoek (*Contin. ad Epist.* p. 119); who found that the infusion of bark divided some of the discs, and coagulated others.

(*c*.) *On man.*—The *topical effects* are astringent and slightly irritant. The astringency depends on tannic acid [and red cinchonic ?]: hence those barks whose infusions are most powerfully affected by gelatine and the sesquiferruginous salts, enjoy the greatest astringent power. Both Loxa and yellow (Calisaya) bark possess this property in a pre-eminent degree: whereas Carthagena bark is deficient in it. The *constitutional effects* are principally manifested by the disordered conditions of the vascular and cerebro-spinal systems. In some conditions of system, cinchona operates as an *irritant* or *stimulant*, in others as a *stomachic*, *tonic*, and *corroborant*.

If a man in a state of perfect health take a small or moderate dose of bark, no obvious effects are produced,—or perhaps a little thirst, with some slight disorder of stomach, or a temporary excitement of appetite may be brought on. If the dose be increased, the alimentary canal becomes disordered (indicated by the nausea, vomiting, loss of appetite, thirst, and constipation, or even purging); a febrile state of the system is set up (manifested by the excitement of the vascular system and dry tongue), and the cerebro-spinal system becomes disordered, as is shewn by the throbbing headache, and giddiness. The disturbance of the functions of the stomach is produced not only when the bark is given in the more nauseating form of powder, but also in the form of infusion or decoction or tincture. These symptoms indicate a stimulant operation, which is still more manifest when the bark is given to a person suffering with gastro-enteritic irritation, accompanied with fever. All the morbid phenomena are exasperated, the febrile disorder is increased, and symptoms of gastritis come on. None of the effects now enumerated include those to which the term *tonic* is properly applicable. These are to be sought for in patients suffering from debility, without symptoms of local irritation. In such we find cinchona improves the appetite, promotes the digestive functions, and increases the strength of the pulse. The muscular system acquires more power, and the individual is capable of making greater exertion, both mental and bodily, than before; the tissues acquire more firmness to the touch, and lose their previous flabbiness: moreover, it has been asserted, and with great probability of truth, that the quality of the blood improves.

The real *stomachic*, *tonic*, and *corroborative* effects of cinchona, as indeed of other agents of the same class, are then only observed in certain morbid conditions.

"The general operation of cinchona bark" observes Sundelin (*Heilmittell.* ii. 307, 3tte Aufl.) "consists in the *increase and exaltation of the tone of the irritable fibres and of the fibres of the vessels* (hence by its use the pulse becomes fuller, stronger, and regular, and the muscular power increased); also in the *general augmentation of the cohesion of the organic mass* (hence it counteracts a tendency to liquefaction [*Verflüssigung*] and disintegration [*Entmischung*], diminishes profuse secretions which proceed from atony of the extremities of the vessels, and of the secerning surfaces and organs, and improves generally the crasis) and, lastly, in the *augmentation of the vital energy of the sensible system.* (By the last mentioned property it restores sensibility, when defective or abnormally increased, and the property of reaction of the nervous system, to their normal state, and augments the influence of this system on the muscular fibre and on the reproductive system)." As these effects are not produced until the active constituents of the bark have been absorbed, they take place gradually, and by the long continued use of this agent.

The power possessed by cinchona of suspending or completely stopping periodical diseases deserves to be noticed here, though it will have to be again referred to hereafter. It is doubtless in some way related to the before mentioned effects; but the connection is, as yet, mysterious and incomprehensible.

Active principles of the cinchona barks.—The cinchona alkaloids are the essential tonic principles of bark. In them also resides the *antiperiodic* (*specific*, as it is frequently termed) power of this remedy (see p. 1006). The tannic acid confers astringent powers, and promotes the tonic operation of the alkaloids, which depend on the alkaloids peculiar to it. The red cinchonic must also slightly contribute to the general effects of the bark. The kinate of lime (supposed by Deschamps to be the active principle of cinchona) is probably inert: it has neither bitterness nor stypticity, and is insoluble in alcohol. The aromatic flavour depends on volatile oil.

Comparison of cinchona with other tonics.—Cinchona scarcely admits of comparison with any other vegetable substance. It is pre-eminently distinguished by its great tonic and almost specific febrifuge properties. It is farther distinguished from the *simple bitters* (as gentian, quassia, simaruba, calumba, &c.) by its astringency; from the *pure astringents* (as oak bark, nutgalls, catechu, kino, &c.) by its extreme bitterness; from the *aromatic bitters* (as cascarilla, chamomile, wormwood, elecampane, &c.) by its astringency and comparative deficiency in volatile oil, and, consequently, in stimulant properties. Willow and angustura barks, perhaps, more closely approximate to cinchona than other vegetable substances in ordinary use. In regard to antiperiodic or febrifuge powers, arsenious acid is the only remedy that can be compared with bark.

Comparison of the cinchona barks with each other.—I need not insist on the superiority of *genuine* over *false* cinchona barks. The inferiority of those barks which have a *whitish epidermis* (as the *Carthagena barks*, see p. 989 et seq.) is shown by the small quantity of cinchona alkaloids which they yield. The anecdote before mentioned (p. 991) proves that the Spaniards had long since ascertained the inferiority of one of these ale, Red, and Yellow (Calisaya) Cinchonas are the kinds which have een principally examined in this country: their pre-eminence over all hers is now universally admitted. The experiment and observations Saunders (*Obs. on the sup. Effic. of red Peruv. Bark*, 1782), Rigby *'ssay on the Use of Red Peruv. Bark*, 1783), Kentish (*Expt. and Obs. a new Spec. of Bark*, 1784), Irving (*Expts. on Red and Quill. Peruv. ark*, 1785), and Skeete (*Expts. and Obs. on Quill. and Red Peruv. Bark*, '86) seem to have established the superiority of *red* bark to the pale or iilled kind. But in adopting this statement we ought, if possible, to certain what kind of pale bark was used in making the above observa-ons? And also to determine whether the red bark referred to be iden-cal with that now in commerce? Dr. Relph (*Inq. into the Med. Effic. ' Yellow Bark*, 1794) afterwards asserted the superiority of *yellow bark* both the pale and red kinds. His statements are borne out by the most exclusive consumption of this bark during the last twenty years.

II. Of the Cinchona Alkaloids. (*a.*) *On vegetables.*—According Goeppert, the leaves of plants plunged in a solution of sulphate of iinia (gr. ss. of the salt to ℥ss. of water) presented evidences of con-action in six or eight hours (Decandolle, *Phys. Vég.* 1349).

(*b.*) *On animals generally.*—As soon as Pelletier had discovered the kalies in bark, he sent some of them to Magendie for trial, who ascer-ined that neither in the pure nor saline state were they poisonous; and found that ten grains of the sulphate or acetate of these bases might injected into the veins of a dog without any ill effect (*Journ. de harm.* vii. 138). Hartl (Wibmer, *Wirk. d. Arzn. ü. Gifte*, Bd. ii. 133) found that three grains of quinia, applied to a wound in a rabbit, casioned no ill effects.

(*c.*) *On man.*—The constitutional effects of the cinchona alkalies are nilar to those of the barks, but more energetic. It will be superfluous, erefore, to enumerate the symptoms caused by *small doses* of these bstances. Far more interesting are the effects of *large doses*, as they ad to a more intimate acquaintance with the kind of influence exer-sed by the barks.

In doses of from ten to twenty or more grains, sulphate of quinia has oduced three classes of effects:—

1. *Gastro-enteritic irritation,* marked by pain and heat in the gastric region, nausea, gripings, and purging. Occasionally ptyalism has been observed. Constipation sometimes follows its use.
2. *Excitement of the vascular system*, manifested by increased frequency and fulness of pulse and augmented respiration. Furred tongue, and other symptoms of a febrile state, are also observed.
3. *Disorder of the cerebro-spinal functions*, indicated by headache, giddiness, contracted, in some cases dilated, pupils, disorder of the external senses, agitation, difficulty of performing various voluntary acts (as writing), somnolency, in some cases delirium, in others stupor.

A remarkable case is mentioned by Trousseau and Pidoux (*Traité de hérap.* ii. 217). A soldier took 48 grains of the sulphate of quinia for e cure of an asthma [spasmodic], which returned daily at a certain our. Four hours after taking it he experienced buzzing in the ears, minished sensibility, giddiness, and violent vomitings. Seven hours ter taking the quinia he was blind and deaf, delirious, incapable of alking on account of the giddiness, and vomited bile copiously. In fact, he was in a state of intoxication. These effects subsided in the course of the night.

Difference in the operation of quinia and cinchonia.—When we take into consideration the analogy of composition and of chemical properties of these two alkaloids, we are led to suspect analogy of physiological effects. When they were in the first instance submitted to examination, cinchonia and its salts were thought, principally on the evidence of Chomel, to be much inferior in activity to quinia and its salts. But the subsequent observations of Dufour, Petroz, Potier, Bally, Nieuwenhuiss, Mariani, Bleynie, and others, have proved that the disulphates of these alkalies may be substituted for each other (*Dict. de Mat. Méd.* t. ii. 288). Nay, Bally gives the preference to the sulphate of cinchonia, on the ground that it is less irritating than the sulphate of quinia. That cinchonia is as active as quinia might have been anticipated, *à priori*, when we recollect that those barks in which cinchonia is the predominant principle have been celebrated as therapeutic agents. This fact of the equal value of cinchonia and its salts with quinia and its salts, acquires some importance from the apprehended failure of the yellow bark, in which the quinia abounds. Practitioners, however, have been so long accustomed to the use of the disulphate of quinia, that as long as this can be procured, some difficulty will be experienced in the introduction into practice of the disulphate of cinchonia.

Comparison of the cinchona alkaloids with their salts.—Some of the salts of the cinchona alkaloids being more soluble than their bases, it has been inferred they are, consequently, more active. But it has been asserted by Nieuenhuiss, Mariani, Bleynie, and others, that the bases are equally active, and may be substituted for the salts with advantage (*Dict. de Mat. Méd.* t. v. p. 596). Acid drinks should be given to favour their solution in the stomach. Quinia, in the crude or impure state, has been employed with success by Trousseau (Soubeiran, *Traité de Pharm.* i. 604). Its advantages over the disulphate, are, that it is less apt to purge; it may be exhibited in a smaller dose, and it loses but little bitterness. This last property facilitates the use of it, especially in children.

Comparison of the salts of the cinchona alkaloids with each other.—I have already described the effects of the *disulphate of quinia.* The *sulphate of quinia* is formed when we dissolve the disulphate in water, acidulated with sulphuric acid: it is somewhat more irritant than the last-mentioned salt. The *phosphate of quinia* is said to be neither so apt to disturb the stomach, nor to excite the vascular system, as the disulphate. Hence it is better adapted for cases accompanied with gastric irritation and febrile disorder. The *ferrocyanate of quinia* has been recommended, in preference to the disulphate, in intermittent fevers, accompanied with inflammatory symptoms. The *tannate of quinia* is declared by Dr. Rolander, of Stockholm, to be the most powerful of the quinia salts. The tannic acid, though not the peculiar febrifuge constituent of cinchona bark, yet contributes to its tonic powers, and thereby promotes the activity of the alkaloids. This statement is supported by the already referred-to remark of Berzelius (see p. 998), that the most active cinchonas are those which contain the largest quantity of tannin. The *nitrate, hydrochlorate, acetate,* and *citrate of quinia*, have been employed in medicine; but I am not acquainted with any remarkable advantages they possess over the sulphate. The *kinate of quinia*, as being one of the native salts of alkaloid, deserves further examination. The *arsenite of quinia* might, perhaps, be found available in some obstinate intermittents, and well deserves examination. The *salts of cinchonia*, except the disulphate, have been imperfectly examined.—(For further details respecting the effects of the salts of quinia, consult Merat and De Lens, *Dict. de Mat. Méd.* t. v. 597 ; and Dierbach, *Neuest. Entd. d. Mat. Med.* Bd. i. S. 238).

Comparison of the cinchona barks with their alkaloids.—It has been asserted, that the cinchona alkaloids possess all the medicinal properties of the barks, and may be substituted for them on every occasion (Magendie, *Formul.* p. 131, 8^{me} éd.) ; but I cannot subscribe to either of these statements ; for, in the first place, the alkalies are deficient in the aromatic quality possessed by the barks, and which assists them to sit easily on the stomach ; and it is to this circumstance that I am disposed to refer a fact which I have often observed, that disulphate of quinia will sometimes irritate the stomach, occasion nausea and pain, and give rise to febrile symptoms, while the infusion of bark is retained without the least uneasiness. Moreover, we must not overlook the tannic acid, which confers on bark an astringent property. So that while we admit that the essential tonic operation of the barks depends on the alkalies which they contain, yet the latter are not always equally efficacious. In some cases, however, they are of great advantage, since they enable us to obtain, in a small volume, the tonic operation of a large quantity of bark.

Uses.—From the preceding account of the physiological effects of cinchona, some of the indications and contra-indications for its use may be readily inferred. Thus its topical employment is obviously indicated in cases of local relaxation, with or without excessive secretion ; also in poisoning by those agents whose compounds with tannic acid are difficultly soluble, and, therefore, not readily absorbed. But as a topical remedy, or astringent, cinchona is greatly inferior to many other agents, which contain a much larger quantity of tannic acid. The contra-indications for the local use of cinchona, are, states of irritation (nervous or vascular), and of inflammation. In these conditions it augments the morbid symptoms.

The indications for its use, as a general or constitutional remedy, are, debility with atony and laxity of the solids, and profuse discharges from the secreting organs. I have observed that it proves less successful, and often quite fails, when the complexion is chloretic or anæmic (see p. 534): in such, chalybeates often succeed where cinchona is useless or injurious. As contra-indications for its employment, may be enumerated acute inflammation, inflammatory fever, plethora, active hemorrhages, inflammatory dropsies, &c. To these may be added, an extremely debilitated condition of the digestive and assimilative organs. Thus, patients recovering from protracted fever are at first unable to support the use of bark, which acts as an irritant to the stomach, and causes an increase of the febrile symptoms. In such I have found infusion of calumba a good preparative for cinchona.

Hitherto I have referred to those indications only which have an obvious relation to the known physiological effects of cinchona. But the diseases in which this remedy manifests the greatest therapeutic power, are those which assume an intermittent or periodical type.

Now in such the *methodus medendi* is quite inexplicable; and, therefore, the remedy has been called a *specific*, an *antiperiodic*, and a *febrifuge*. But the more intimately we become acquainted with the pathology of disease, and the operation of medicines, the less evidence have we of the specific influence of particular medicines over particular maladies. Some diseases, however, are exceedingly obscure; their seat or nature, and the condition of system under which they occur, or the cause of their occurrence, being little known. There are also many medicines, the precise action of which on the system is imperfectly understood, but which evidently exercise a most important, though to us quite inexplicable, influence over the system. Now it sometimes happens that imperfectly-known diseases are most remarkably influenced by remedies, the agency of which we cannot comprehend: in other words, we can trace no known relation between the physiological effects of the remedy and its therapeutical influence. This incomprehensible relationship exists between arsenic and lepra; between the cinchona bark and ague. But though this connexion is to us mysterious (for I do not admit the various hypotheses which have been formed to account for it), we are not to conclude that it is necessarily more intimate than that which exists in ordinary cases.

1. *In Periodical or Intermittent Diseases.*—The system is subject to several diseases, which assume a *periodical* form; that is, they disappear and return at regular intervals. When the patient appears to be quite well during the interval (*i. e.* when the intermission is perfect and regular) the disease is called an *intermittent;* whereas it is called *remittent* when the second paroxysm makes its appearance before the first has wholly subsided (*i. e.* when the disease presents exacerbations and remissions, but not intermissions). The pathology of these affections is involved in great obscurity, and the cause or causes of their periodicity are completely unknown. Various circumstances, however, induce us to regard intermittent maladies as morbid affections of the nervous system; for the phenomena, both healthy and morbid, of periodicity seem to be essentially nervous. (See some remarks on periodic movements in Müller's *Elem. of Phys.* by Baly, vol. i. p. 924).

One of the most curious circumstances connected with the history of these diseases is the facility with which they are sometimes cured. It is well known that sudden and powerful impressions, both mental and corporeal (as those caused by terror, alcohol, opium, cinchona, arsenious acid, &c.) made during the intermission, will sometimes prevent the return of the succeeding paroxysm; and occasionally from that time all morbid phenomena disappear. In remittent diseases, on the other hand, the same impressions are much less frequently successful, and sometimes instead of palliating, exasperate the symptoms. The agents which are capable, under certain circumstances, of making these curative impressions, are apparently so dissimilar in their nature and physiological action, that we can trace in their *methodus medendi* scarcely anything in common, save that of making a powerful impression on the nervous system. Of these *antiperiodic* agents cinchona and arsenious acid stand pre-eminent for their greater frequency of success, and, therefore, are those usually resorted to. I have already (see p. 392) made some remarks on their relative therapeutical value. They differ in two particulars; first, cinchona may be given, as an antiperiodic, in any quantity which the stomach can bear; whereas arsenious acid must be exhibited in cautiously regulated doses; secondly, there are two modes of attempting the cure of an intermittent by cinchona,—one is to put an immediate stop to the disease by the use of very large doses of the remedy given a few hours prior to the recurrence of the paroxysm,—the other is to gradually extinguish the disease by the exhibition of moderate doses at short intervals during the whole period of the intermission, so that the violence of every succeeding paroxysm is somewhat less than that of the preceding one;—but in the case of arsenious acid the latter method is alone safe and, therefore, to be adopted.

It has been asserted that cinchona is admissible in the interval only of an intermittent fever; and that if it be exhibited during the paroxysm it has a tendency to prevent the subsidence of the latter. But this statement is much overcharged. Morton (*Pyretologia*) and others have given it in almost every stage without injury. Dr. Heberden (*Comment.* art. *Feb. Interm.*) observes, "the only harm which I believe would follow from taking the bark even in the middle of the fit is, that it might occasion a sickness, and might harass the patient by being vomited up, and might set him against it." It is, however, more efficacious during the interval, though it may not be absolutely hurtful in the paroxysm. Dr. Cullen (*Mat. Med.* ii. 96) was strongly of opinion that the nearer the exhibition of the cinchona is to the time of accession, the more certainly effectual will it be. I have already stated (p. 392) that arsenious acid may be given with good effect during the whole period (paroxysm and intermission) of the disease.

A very necessary condition to its perfect success is that it sit well on the stomach; for if it occasion vomiting or purging it is much less likely to act beneficially. Hence an emetic and a purgative are recommended to precede its employment. The use of these is more especially necessary if the disease be recent. For an adult about 15 grains of ipecacuanha with a grain of tartarized antimony may be exhibited as an emetic, unless there be symptoms of determination to the brain, or of inflammation of the digestive organs. A senna draught, with a calomel pill, forms a good purgative. To enable it to sit well on the stomach, cinchona (or the sulphate of quinia) is frequently given in conjunction with aromatics. The infusion or decoction of cinchona, though much less effective are, however, less liable to disturb the stomach than the powder of cinchona or the sulphate of quinia. Opium is sometimes a necessary adjunct to cinchona to prevent its running off by the bowels. In some cases where the stomach was too irritable to admit of the administration of cinchona or sulphate of quinia by the *mouth*, these agents have been otherwise introduced into the system. Thus *clysters* of cinchona were used by Helvetius, Torti, and Baglivi (Murray, *App. Med.* i. 871). Van Swieten (*Commentaries*, vii. 277) says he has often seen this method successful in young children; but that it takes three times as much bark as would suffice if the remedy were swallowed. *Cataplasms* of cinchona have also been employed. Rosenstein applied them to the abdomen; Torti to the wrist (Murray, *op. cit.* 872). Alexander (*Exper. Essays*, 38) cured an ague by a *pediluvium* of decoction of cinchona; but Heberden (*Comment.*) tried it without success. *Bark jackets* were employed with success in the agues of children by Dr. Pye (*Med. Obs.* and *Inq.* ii. 245). They consisted of waistcoats between whose layers powdered cinchona was quilted. The dry powder of cinchona has been *applied to the skin*:

thus Dr. Darwin strewed it in the patient's bed. Chrestien (*De la Méthode Iatralept.* 232 and 270) successfully used the tincture and alcoholic extract by the *iatraleptic method* (see p. 48). More recently sulphate of quinia has been employed in the same way. The last mentioned preparation has also been applied by the *endermic method* (*Archiv. Gén. de Méd.* 1826; *Revue Méd.* 1827): but this mode of using it is sometimes attended with intense pain and an eschar (Trousseau and Pidoux, *Traité de Thérap.* ii. 219). To infants at the breast, Rosenstein advises its indirect exhibition *by the nurse*, in whose milk its active principle is administered to the child (*Ibid.* 231). More recently sulphate of quinia mixed with tobacco (in the proportion of 15 grs. of the former to an ounce of the latter) has been employed as a *snuff* in intermittent headache.

Cinchona and its preparations prove most successful in the simple or uncomplicated form of intermittents; that is, where the disease appears to be purely nervous. But when agues are accompanied with inflammatory excitement or with visceral diseases, cinchona generally proves either useless or injurious. In remittents it proves much less successful than in regularly-formed intermittents. In all these cases we endeavour to promote the efficiency of the cinchona by reducing the disease to the form of a pure or simple intermittent. The means to effect this must of course depend on a variety of circumstances; but blood-letting, both general and local, purgatives, and diaphoretics, are those which for the most part will be found available. Under some circumstances mercury given in alterative doses, or even as a very slight sialogogue, proves beneficial.

Intermittent fevers are not the only periodical diseases in which cinchona has been found beneficial. It is a remedy which has proved serviceable in several other cases in which a paroxysm (of pain, spasm, inflammation, hemorrhage, or fever) returns at stated periods. Thus intermittent neuralgia, rheumatism, headache, amaurosis, catarrh, ophthalmia, stricture, &c. have been greatly benefitted by its use. Some of these affections have been regarded as *masked agues.* When periodical diseases recur at uncertain periods, as in the case of epilepsy, no particular advantage can be expected from the use of cinchona.

2. *In Continued Fever.*—In the latter stage of continued fever, when the vital powers are beginning to sink, and where there is no marked and decided symptom of inflammatory disease of the brain or digestive organs, cinchona or sulphate of quinia sometimes proves highly beneficial. If the tongue be dry, as well as furred, and the skin hot and dry, no advantage, but the reverse, can be anticipated from its employment. It is most applicable to the low forms of fever occurring in debilitated constitutions. When exacerbations or remissions, however indistinct, occur at regular periods, the administration of cinchona is the more likely to be followed by good effects. Under the preceding circumstances there can scarcely be two opinions as to the admissibility of bark. But on the general propriety of administering this remedy in continued fever, considerable difference of opinion has prevailed (Clutterbuck, *On the Seat and Nature of Fever*, 399, 2nd edit. 1825). Dr. Heberden (*Comment.*) cautiously observes, "I am not so sure of its being useful as I am of its being innocent." In order to avoid offending the stomach, it is frequently advisable to begin with the infusion, for which afterwards,

first the decoction, then the sulphate of quinia, may be substituted. In the stage of convalescence, the use of cinchona or sulphate of quinia may often be advantageously preceded by infusion of calumba: without this precaution, irritation of stomach or febrile symptoms are readily set up.

3. *In inflammatory diseases.*—As a general rule, stimulants and tonics, as cinchona, are improper in inflammatory diseases. Yet to this statement, which applies principally to the first stage, to acute and active cases, and to the disease when it occurs in strong and vigorous habits, many exceptions exist. Thus, when it takes place in old and debilitated constitutions; when it is of a mild or atonic character, and has existed for some time without giving rise to any obvious organic changes; when it assumes an intermittent or even remittent form; or when it is of a certain quality, which experience has shown to be less benefited by ordinary antiphlogistic measures, cinchona is sometimes admissible and advantageous after evacuations have been made proportioned to the activity of the disease and the vigour of the system. *In scrofulous inflammation* (as of the eye) its value is fully appreciated. *In rheumatism*, in which disease Morton, Fothergill, Saunders, and Haygarth, have so strongly recommended it, its use is now obsolete, except under circumstances similar to those which regulate its employment in ordinary inflammation. The same remarks apply to its employment in *erysipelatous inflammation*, in which it was at one time much esteemed.

4. *In maladies characterized by atony and debility.*—Cinchona is useful in a great variety of diseases dependent on, or attended by, a deficiency of tone or strength, as indicated by a soft and lax condition of the solids, weak pulse, incapability of great exertion, impaired appetite, and dyspeptic symptoms. Thus, *in chronic atonic affections of the alimentary canal* it proves very serviceable, especially in some forms of dyspepsia and anorexia. In these it should be given half an hour, or an hour, before meal-times. *In some chronic maladies of the nervous system*, as chorea, when it occurs in delicate girls; also in the neuralgia of weakly subjects. *In mortification*, it is useful in those cases in which tonics and astringents are obviously indicated; but it has no specific power of checking the disease, as was formerly supposed. *In passive hemorrhages*, from relaxation of vessels, as in some cases of profuse menstruation, or uterine hemorrhage consequent on miscarriage. *In profuse mucous discharges* with great debility, as in leucorrhœa, excessive bronchial secretion, old diarrhœas, &c. *In cachectic diseases*, as enlargements and indurations of the absorbent glands, of a scrofulous nature, strumous ophthalmia, obstinate ulcers, &c. (see Dr. J. Fordyce, *Med. Obs. and Inq.* i. 184). Also in venereal diseases, when the secondary symptoms occur in shattered and broken-down constitutions, and after the full use of mercury. Likewise in some of the chronic skin diseases, which are seen in cachectic habits.

5. *In the convalescence* of either acute or chronic lingering diseases, as fever, inflammation, hemorrhage, profuse suppuration, &c.; also after important surgical operations, when the strength is greatly reduced. In no class of cases is the efficacy of cinchona or its alkaloids more manifest than in these.

6. *As a topical astringent and antiseptic.*—The efficacy of cinchona as an astringent and antiseptic depends on tannic acid. But as many

vegetable substances exceed cinchona in the quantity of this acid which they contain, so they surpass it in astringency. Hence the topical uses of bark are, comparatively, unimportant; and, for the most part, are nearly obsolete. Powdered cinchona is frequently employed as a tooth powder. Formerly it was used as an application to mortified parts, foul ulcers, caries, &c. The decoction, with or without hydrochloric acid, is applied as a gargle in putrid sore throat.

7. *As a chemical antidote.*—The value of cinchona bark, as a chemical antidote, depends on its tannic acid. I have already offered some observations on its employment in poisoning by emetic tartar (see p. 421). I believe, in all cases it might be advantageously replaced by other and more powerful astringents; as nutgalls, or, on an emergency, green tea.

Administration.—In the form of *powder*, cinchona is now rarely administered. The bulk of a full dose, its disagreeable taste, its tendency to cause nausea and vomiting, and the quantity of inert woody fibre which it contains, form great objections to its employment. Yet of its great efficacy, as a febrifuge or antiperiodic, in intermittents, and of its superiority in these cases, to the decoction or infusion, no doubt can exist; but sulphate of quinia has almost entirely superseded it. Its dose is from a scruple to a drachm, or even more than this, when the stomach can bear it.

1. *Infusum Cinchonæ*, L. E. D. (Lance-leaved Cinchona [any species of Cinchona, according to prescription, *E.*], bruised [in powder, *E.*, in fine powder, *D.*], ℥j.; Boiling [Distilled, *L.* Cold, *D.*] Water, Oj. [f℥xij. *D.*]:—Macerate for six (four, *E.*) hours in a vessel lightly covered, and strain [through linen or calico, *E.*]—The directions of the *Dublin College* are as follows: Triturate the bark with a little of the water, and during the trituration pour on the rest; macerate for 24 hours, shaking it from time to time, then pour off the clear liquor). Water extracts from cinchona bark the kinates of quinia, cinchonia, and lime gum, soluble red cinchonic (tannin) and yellow colouring matter. The greater part of the cinchona alkaloids remains in the marc, as a very small quantity only of the compound of red cinchonic and the cinchona alkaloids is extracted.—The infusion of cinchona is stomachic and tonic, but is scarcely energetic enough to be febrifuge. It is a light preparation, applicable as a tonic where the stomach is very delicate, and cannot support the more active preparations of this medicine. The dose is f℥j. to f℥ij. thrice a day.

2. *Decoctum Cinchonæ*, E.—(Crown, Gray, Yellow, or Red Cinchona, ℥j. bruised; Water, f℥xxiv. Mix them, boil for ten minutes, let the decoction cool, then filter it, and evaporate to sixteen fluidounces).

Decoctum Cinchonæ, D.—(Bark of Lance-leaved Cinchona, coarsely powdered, ℥j.; Water a sufficient quantity to afford a pint after straining).

Decoctum Cinchonæ cordifoliæ, L.—(Heart-leaved Cinchona, bruised, ℥x.; Distilled Water, Oj. Boil for ten minutes in a lightly-covered vessel, and strain the liquor while hot).

Decoctum Cinchonæ lancifoliæ, L.—(As the preceding, but using Lance-leaved Cinchona).

Decoctum Cinchonæ oblongifoliæ, L.—(As the preceding, but using Oblong-leaved Cinchona).

By boiling, water extracts from cinchona the kinates of quinia, cinchonia, and lime, gum, soluble red cinchonic (tannin), yellow colouring matter, starch, and a portion of the compound of the red cinchonic with the cinchona alkaloids. While hot, the liquor is transparent; but as it cools it becomes turbid, owing partly to the deposition of the tannate of starch when the temperature falls below 88° F.; and partly because the red cinchonic compound being more soluble in hot than in cold water, is deposited on cooling. Of 146 parts of the deposit from decoction of yellow (Calisaya) bark, Soubeiran (*Traité de Pharm.* i. 607) found 60 parts (principally tannate of starch) were insoluble in alcohol, and the remaining 86 parts were readily soluble in alcohol, and yielded the cinchona alkaloids. The same author also found that by decoction, yellow (Calisaya) bark lost 2-3rds of its weight; whereas by infusion it merely lost 1-3rd of its weight. If the water employed in preparing the decoction or infusion be acidulated (with sulphuric or hydrochloric acid) the medicinal value of the preparation is greatly increased; for the acid decomposes the insoluble red cinchonic salt, and forms, with the cinchona alkaloids, a soluble combination. Alkaline solutions, on the other hand, yield less powerful, though highly coloured, preparations: they readily dissolve the red cinchonic and the acids, but they render the alkaloids insoluble. Decoction of cinchona is stomachic, tonic, and febrifuge. The dose is f℥j. to f℥ij.

3. *Tinctura Cinchonæ*, L. E. D.—(Heart-leaved [Yellow, or any other species, according to prescription, *E.*, Lance-leaved, *D.*] Cinchona, bruised [in fine powder, *E.*, coarsely powdered, *D.*], ℥viij. [℥iv. *E. D.*]; Proof Spirit, Oij. [Oj. *E.*] Macerate for fourteen [seven, *D.*] days, and strain. The directions of the *Edinburgh College* are as follow:—"Percolate the bark with the spirit, the bark being previously moistened with a very little spirit, left thus for ten or twelve hours, and then firmly packed in the cylinder. This tincture may also be prepared, though much less expeditiously, and with much greater loss, by the usual process of digestion, the bark being in that case reduced to coarse powder only." Spirit extracts all the bitter and astringent principles of cinchona; both the kinates of the cinchona alkaloids, as well as the combination of these substances with the red cinchonic. If the spirit be too concentrated the kinates are less readily dissolved by it. Tincture of cinchona is stomachic, tonic, and stimulant. The dose of it is fʒj. to fʒiij. It is usually employed as an adjuvant to the infusion or decoction of cinchona, or to the solution of the sulphate of quinia.

4. *Tinctura Cinchonæ composita*, L. E. D. (Lance-leaved Cinchona [Yellow Bark, *E.*] bruised [coarsely powdered, *D. E.*; fine, if percolation be followed, *E.*], ℥iv. [℥ij. *E. D.*]; Orange Peel [Bitter, *E.*], dried [bruised, *E.*], ℥iij. [℥iss. *E.*, ℥ss. *D.*]; Serpentary, bruised, ʒvj. [ʒiij. *E. D.*]; Saffron [chopped, *E.*], ʒij. [ʒj. *E. D*]; Cochineal, powdered, ʒj. [℈ij. *E. D.*]; Proof Spirit, Oij. [Oj. and f℥iij. *E.*, f℥xx. *D.*] Digest for fourteen days, and strain. "Digest for seven days; strain and express strongly; filter the liquors. This tincture may also be conveniently prepared by the method of percolation, in the same way as the compound tincture of cardamom," *E.*)—This is usually sold as *Huxham's Tincture of Bark.* It is a more agreeable and more stimulant, though less powerful, tonic than the simple tincture, and is less apt to disturb the stomach. Made according to the London Pharmacopœia, it contains one-half less cinchona than the simple tincture. It is employed as a tonic and stomachic. The dose of it is fʒj. to fʒiij.

5. *Extractum Cinchonæ*, E.—(Take any of the varieties of Cinchona, but especially the Yellow or Red Cinchona, in fine powder, ℥iv.; Proof Spirit, f℥xxiv. Percolate the cinchona with the spirit; distil off the greater part of the spirit; and evaporate what remains in an open vessel over the vapour-bath to a due consistence).

Extractum Cinchonæ, D.—(Pale Bark, coarsely powdered, lb. j.; Water, Ovj. Boil for a quarter of an hour, in a vessel almost covered; then having filtered the liquor while yet hot, and laid it aside, boil the bark again in an equal quantity of water, and filter again in the same manner; proceed in the same way a third time, and then mixing all the liquors, reduce them by evaporation to a proper consistence).

Extractum Cinchonæ cordifoliæ, L.—(Heart-leaved Cinchona, bruised, ℥xv.; Distilled Water, *Cong.* iv. Boil down in a gallon of the water to six pints, and strain the liquor while hot. In the same manner boil down the bark in an equal measure of water four times, and strain. Lastly, all the liquors being mixed, evaporate to a proper consistence).

Extractum Cinchonæ lancifoliæ, L.—(Prepared as the preceding, using Lance-leaved Cinchona).

Extractum Cinchonæ oblongifoliæ, L.—(Prepared as the preceding, using Oblong-leaved Cinchona).

The *watery extract of cinchona* (*extractum cinchonæ*, L. D.) contains the same constituents already mentioned (p. 1010) as being found in decoction of bark. Mr. Brande (*Dict. of Pharm.* 179) says, lance-leaved [*i. e.* pale] bark yields 30 per cent. of watery extract. The active principles of this preparation are the kinates of the cinchona alkaloids. The *spirituous extract* (*extractum cinchonæ*, E.) is a more efficacious preparation, as it contains, besides the alkaline kinates, the compound of the red cinchonic with the cinchona alkaloids. When prepared with rectified spirit, 24 per cent. of extract is obtained from lance-leaved [*i. e.* pale] bark. But as the *Edinburgh College* direct proof spirit to be employed, the produce is larger.—Well prepared (*i. e.* not decomposed by evaporation) extract is a very useful preparation, which, however, has been nearly superseded by sulphate of quinia. It is given in the form of pill, in doses of from gr. v. to gr. xx. Or the watery extract may be dissolved in water, or in infusion of roses, or, for administration to children, in syrup of mulberries or of orange-peel.

6. *Quinæ Disulphas*, L. E.—*Sulphate of Quinine*, offic. The directions of the *London College* for the preparation of this salt are as follows:—

Take of Heart-leaved Cinchona, bruised, lb. vij.: Sulphuric Acid, ℥ix.; Purified Animal Charcoal, ℥ij.; Hydrated Oxide of Lead; Solution of Ammonia; Distilled Water, each as much as may be sufficient. Mix four ounces and two drachms of the Sulphuric Acid with six gallons of distilled Water, and add the Cinchona to them; boil for an hour, and strain. In the same manner again boil what remains in Acid and Water, mixed in the same proportions, for an hour, and again strain. Finally, boil the Cinchona in eight gallons of distilled water for three hours, and strain. Wash what remains frequently with boiling distilled water. To the mixed liquors add Oxide of Lead, while moist, nearly to saturation. Pour off the supernatant liquor, and wash what is thrown down with distilled water. Boil down the liquors for a quarter of an hour, and strain; then gradually add Solution of Ammonia to precipitate the Quina. Wash this until nothing alkaline is perceptible. Let what remains be saturated with the rest of the Sulphuric Acid, diluted. Afterwards digest with two ounces of Animal Charcoal, and strain. Lastly, the Charcoal being thoroughly washed, evaporate the liquor cautiously, that crystals may be produced.

Mr. Phillips (*Transl. of the Pharm.*) gives the following explanation of this process. "The quina exists in combination with a peculiar acid, called Kinic Acid, forming with it Kinate of Quina, which is soluble to a certain extent in water, and is rendered more so by the sulphuric acid employed in the process, and perhaps by decomposing it. Whatever may be the state of combination, the solution contains sulphuric acid, kinic acid, and quina, mixed with extractive and colouring matter, the latter being got rid of by the animal charcoal. On adding oxide of lead the sulphuric acid combines with it, and the resulting sulphate being insoluble is precipitated, while the kinic acid and quina remain in solution; when ammonia is added, after the separation of the sulphate of lead, the kinic acid unites with it, and the kinate of ammonia formed is soluble, while the quina is precipitated, and this, when afterwards combined with sulphuric acid, forms disulphate of quina, which crystallizes."

The directions of the *Edinburgh College* for the preparation of disulphate of quina are as follows:—

Take of Yellow Bark, in coarse powder, one pound; Carbonate of Soda, eight ounces; Sulphuric Acid, half a fluid ounce; Purified Animal Charcoal, two drachms. Boil the bark for an hour in four pints of water, in which half the carbonate of soda has been dissolved; strain and express strongly through linen or calico; moisten the residuum with water, and express again, and repeat this twice. Boil the residuum for half an hour with four pints of water and half the sulphuric acid; strain, express strongly, moisten with water, and express again. Boil the residuum with three pints of water and a fourth part of the acid; strain and squeeze as before. Boil again the residuum with the same quantity of water and acid; strain and squeeze as formerly. Concentrate the whole acid liquids to about a pint; let the product cool; filter it, and dissolve in it the remainder of the carbonate of soda. Collect the impure quina on a cloth, wash it slightly, and squeeze out the liquor with the hand. Break down the moist precipitate in a pint of distilled water; add nearly one fluidscruple of sulphuric acid, heat it to 212°, and stir occasionally. Should any precipitate retain its gray colour, and the liquid be neutral, add sulphuric acid, drop by drop, stirring constantly, till the gray colour disappears. Should the liquid redden litmus, neutralize it with a little carbonate of soda. Should crystals form on the surface, add boiling distilled water to dissolve them. Filter through paper, preserving the funnel hot; set the liquid aside to crystallize; collect and squeeze the crystals; dissolve them in a pint of distilled water heated to 212°; digest the solution for fifteen minutes with the animal charcoal; filter, and crystallize as before. Dry the crystals with a heat not exceeding 140°.

The mother-liquors of each crystallization will yield a little more salt by concentration and cooling.

The object of this process is to extract, by means of the solution of carbonate of soda, the acids, the colouring and extractive matters, the gum, &c. from the bark, but leaving the cinchona alkaloids. Stoltze used for this purpose lime, Badollier and Scharlau caustic potash (see p. 999). The alkaline decoction has a very deep colour. By boiling the residuum in water acidulated with sulphuric acid, the alkaloids are dissolved. On the addition of carbonate of soda, double decomposition takes place, and the impure quinia is precipitated. This is afterwards dissolved in water acidulated with sulphuric acid, and the filtered liquid set aside to crystallize. The impure disulphate of quinia thus obtained is re-dissolved in boiling water, and the solution, after being decolorized by digestion with animal charcoal, is filtered, and put aside to crystallize.

I have repeated this process, which has the great merit of obviating the use of alcohol, and I believe it to be an excellent one, combining both simplicity and economy. In one experiment I employed one lb. of picked uncoated yellow (Calisaya) bark, and found that the precipitated impure quinia required two fluidscruples and five minims of sulphuric acid to saturate it, instead of one fluidscruple, directed by the Edinburgh College. In another experiment I could not get the impure sulphate of quinia to crystallize until it had been digested with animal charcoal.

The method of manufacturing disulphate of quinia, which has been usually followed by *manufacturers* in this country, is as follows:—

Coarsely pulverized yellow (Calisaya) bark is boiled with water acidulated with sulphuric or hydrochloric acid. The residuum boiled a second and a third time with acidulated water. Some repeat the process a fourth time. Finely-powdered slacked lime is added to the filtered decoction (when cold), until the liquor is sensibly alkaline, and acquires a dark colour. The precipitate is collected, drained on a cloth, and then submitted to graduated pressure (usually in a hydraulic press). The cake thus obtained is, when dry, reduced to powder, and digested in rectified spirit. The filtered tincture is distilled until the residuum (impure quinia) in the retort has a brown viscid appearance. This residuum is then to be carefully saturated with very diluted sulphuric acid, the solution filtered, and set aside to crystallize. The sulphate of quinia thus obtained is yellowish-brown. It is drained in a cloth, compressed, dissolved in water, decolorized by animal charcoal, re-crystallized, and dried. This last part of the process must be very carefully conducted, to avoid efflorescence.

Some persons think it preferable to convert the quinia of this alcoholic solution into a sulphate before distillation, in order to separate the fatty matter. I am informed, by a maker of this salt, that the use of spirit in the process does not, on the large scale, add much more than a penny an ounce to the cost of the disulphate, as the greater part is recovered.

On the large scale the decoction of the bark is usually prepared in a vat, the boiling being effected by steam. The acidulated decoction contains the quinia, the cinchonia, the yellow colouring matter, the red cinchonic, the kinic, and the sulphuric (or hydrochloric) acids. The lime saturates all the acids, and forms soluble salts (if sulphuric acid have been employed, sulphate of lime is formed, the greater part of which precipitates), which remain in the liquid with a portion of red colouring matter. The precipitate is composed of quinia, cinchonia, a combination of lime and red cinchonic, fatty matter, excess of lime, and, when sulphuric acid has been employed, sulphate of lime: the whole is contaminated with colouring matter. Alcohol extracts from this precipitate the quinia and cinchonia, the fatty matter, and the colouring matter; leaving undissolved the excess of lime, the compound of lime with the red cinchonic, and, when sulphuric acid has been used, sulphate of lime. The sulphuric acid being then added to the impure quinia, converts it into a disulphate.

On account of the expense of spirit of wine, various substitutes have been proposed. Pyroxilic spirit has been tried, but I believe has not answered. Pelletier has taken out a patent for the employment of a volatile oil (oil of turpentine). The dried cake of quinia and lime, obtained in the usual manner, is to be digested in oil of turpentine, which dissolves the quinia. This oleaginous solution is then to be agitated with water acidulated with sulphuric acid, by which a sulphate of quinia is obtained. By repose the oil rises to the top, and after removal may be employed again, while the solution of the sulphate is to be evaporated as usual. Hitherto, however, this process has not succeeded, partly because the turpentine does not extract more than 19-twentieths of the quinia present. If any attempts, however, should be made to procure the disulphate in America, it is possible that some modification of this process would be the best.

The *physical and chemical properties* of disulphate of quinia have been already described (p. 995).

Adulteration.—Various foreign bodies (as earthy and alkaline salts, gum, sugar, starch, fatty matters, sulphate of cinchonia, and salicin) are, it is said, occasionally intermixed with disulphate of quinia. The following are the tests by which the presence of these bodies is ascertained:—By digesting disulphate of quinia in alcohol this salt is dissolved, leaving any alkaline or earthy sulphates, gum, or starch, that may be present. Gum is soluble in cold water; starch is coloured blue by a solution of iodine. When heated in the open air the disulphate of quinia is burned and dissipated: the earthy salts, on the other hand, are left. The disulphate is soluble in water acidulated with sulphuric acid, whereas fatty matters are insoluble. To detect sugar, add to a solution of the disulphate, carbonate of potash: quinia precipitates, while sulphate of potash and sugar are left in solution: the latter may be detected by its sweet taste, or by evaporating the liquid to dryness, and digesting the residue with spirit, which dissolves the sugar, but leaves the sulphate. Ammoniacal salts are detected by the ammoniacal odour emitted on the addition of caustic potash. Salicin may be recognized by oil of vitriol, which turns it red (see p. 730). Sulphate of cinchonia may be made to crystallize, in a pulverulent form, by stirring the solution, and in this state it may be readily intermixed with disulphate of quina. This fraud, I suspect, has been recently carried on to no very slight extent. To detect it, precipitate a solution of the suspected salt in water by potash; collect the precipitate, and boil it in alcohol. The cinchonia crystallizes as the liquor cools, while the quinia remains in the mother-liquor.

The characteristic marks of the purity of disulphate of quinia are, according to the *London College*, as follows:—

"Totally dissolved in water, especially when mixed with an acid. Quina is thrown down by ammonia, the liquor being evaporated; what remains ought not to taste of sugar. One hundred parts of disulphate of quina lose eight or ten parts of water with a gentle heat. It is totally consumed by fire. Chlorine first added to it, and afterwards ammonia, it becomes green."

The characters given by the *Edinburgh College* are as follows:—

"A solution of ten grains in a fluidounce of distilled water, and two or three drops of sulphuric acid, if decomposed by a solution of half an ounce of carbonate of soda, in two waters, and heated till the precipitate shrinks and fuses, yields, on cooling, a solid mass, which, when dry, weighs 7·4 grains, and in powder dissolves entirely in solution of oxalic acid."

The quinia, separated from the sulphate by carbonate of soda, is nearly insoluble in a solution of carbonate of soda.

Disulphate of quina is given in doses of from gr. j. to grs. v. Occasionally it is exhibited in much larger doses as a febrifuge; but it is very apt to disagree, causing disturbance of stomach, febrile disorders, and headache. I have known fourteen grains taken, and have heard of a scruple or half a drachm being exhibited at a dose. It may be given either in the form of pill, made with conserve of roses, or dissolved in some aqueous liquid by the aid of an acid. Infusion of roses is a favourite vehicle for it.

Cephaë'lis Ipecacuan'ha, Richard, L. E. D.—*The Ipecacuanha Cephaëlis.*

Callicocca Ipecacuanha, *Brotero.*

Sex. Syst. Pentandria, Monogynia.

(Radix, *L. D.*—Root, *E.*)

History.—Ipecacuanha is first mentioned by Michael Tristram (Purchas, *Pilgrimes*, vol. iv. fol. 1311), who calls it *Igpecaya* or *Pigaya.* In 1648 it was described and figured by Piso (*Hist. Nat. Brasil.* 101). In 1686 it was celebrated in Paris as a remedy for dysentery. It appears that Jean-Adrian Helvetius (then a young man) attended with Afforty, a member of the faculty, a merchant, named Grenier, or Garnier, who, when he recovered from his illness, gave to his physician, as a testimony of gratitude, some of this root, as a valuable remedy for dysentery. Afforty attached very little importance to it, but gave it to his pupil, Helvetius, who tried it, and thought he had found in it a specific against dysentery. Numerous placards were placed about the streets of Paris, announcing to the public the virtues of the new medicine, which Helvetius sold without discovering its nature. Luckily for him, some of the gentlemen of the court, and even the Dauphin, the son of the king (Louis XIV.) were at this time afflicted with dysentery. Being informed by his minister Colbert of the secret possessed by Helvetius, the king deputed his physician Aquin and his confessor le P. de Chaise to arrange with Helvetius for the publication of the remedy. 1000 Louis-d'or was the price which was paid, after some trials had been made with it at the Hôtel-Dieu, and which were crowned with the most brilliant success. Garnier now put in his claim for a part of the reward, saying that he, properly speaking, was the discoverer of the medicine; but the claim was not allowed. Subsequently Helvetius obtained the first medical honours of France. He wrote a treatise, describing the use of ipecacuanha in diarrhœa and dysentery (K. Sprengel, *Hist. de la Méd.* t. v. p. 468).

Great confusion existed for a long time respecting the plant yielding Ipecacuanha. In 1800 Dr. Gomes returned from the Brazils, and brought with him the plant, on which he published a dissertation. In 1802 Brotero (*Trans. of the Linn. Soc.* vol. vi. p. 137) described it under the name of *Callicocca Ipecacuanha*, which Richard (*Bull. de la Soc. de la Fac. de Méd.* 1818) afterwards changed to *Cephaëlis Ipecacuanha.*

Botany. *Gen. Char.*—Tube of the *calyx* obovate; limb very short, five-toothed. *Corolla* somewhat funnel-shaped; its lobes five, small, rather obtuse. *Anthers* inclosed. *Stigma* bifid, usually exserted. *Berry* obovate-oblong, crowned with the remains of the calyx, two-celled, two-seeded (D. C.)

Fig. 191.

Cephaëlis Ipecacuanha.

Sp. Char.—*Stem* ascending, at length erect, somewhat pubescent at the apex. *Leaves* oblong-ovate, rough above, finely pubescent beneath. *Stipules* cleft into setaceous segments. *Heads* terminal, erect, at length pendulous. *Bracts* four, somewhat cordate (D. C.)

Root perennial, annulated, simple, or dividing into a few diverging branches, flexuous, from four to six inches long; when fresh, pale brown externally. *Stem* somewhat shrubby, two or three feet long, emitting runners. *Leaves* rarely more than four or six, placed at the end of the stem and branches; *petioles* pubescent, which are connected to each by the erect stipules. *Stipules* membranous at their base. *Peduncles* solitary, erect when in flower, reflexed when in fruit. *Head* semiglobose, eight- to ten-flowered. *Involucre* one-leafed, spreading, deeply four- to six-parted: segments obovate. *Bracts* acute, pubescent; a single one to each flower. *Calyx* minute. *Corolla* white. *Stamens* five. *Ovary* obovate; *style* filiform, white; *stigmas* linear, spreading. *Berry* soft, fleshy, violet-black. *Seeds* (nucules) pale, plane-convex: *albumen* horny.—(Condensed from Martius, *Spec. Mat. Med. Brasil.* p. 5, 1824).

Hab.—Brazil; in moist shady situations from 8° to 20° south latitude. Abundant in the valleys of the granitic mountains, which run (more or less distant from the sea) through the provinces of Rio Janeiro, Espirito Santo, and Bahia; also met with in Pernambuco. Humboldt and Bonpland found it on the St. Lucar mountains of New Granada.

Collection of the Roots.—The roots are gathered at all seasons of the year, though more frequently from January to March inclusive; and as no care is taken in the cultivation of the plant, it has become scarce around the principal towns. Those Brazilian farmers who reside in the neighbourhood of the plant, carry on considerable commerce with it. The native Indians also are very assiduous in the collection of it. Those called by the Portuguese the Coroados, who live near the river Xipotó, in the province of Mínaes, as well as their neighbours, the Purí, are the greatest collectors of it. They sometimes leave their villages for two months at a time, fixing their habitations in those places in which this plant abounds. They cut the roots from the stems, dry them in the sun, and pack them in bundles of various sizes and forms (Martius, *op. cit.* p. 6).

Commerce.—Ipecacuanha is imported into this country from Rio Janeiro, in bales, barrels, bags, and serons. The duty is 1s. per lb. The quantities on which this was paid, for the last six years, are as follow:—

In 1834	9,038 lbs.	In 1837	11,435 lbs.
1835	7,469	1838	12,426
1836	11,437	1839	7,453

Description.—The root of this plant is the *ipecacuanha* (*radix ipecacuanhæ*) of the shops. No other root is known in English commerce by this name. By continental writers it is denominated *annulated ipecacuanha* (*radix ipecacuanhæ annulatæ*) to distinguish it from the roots of Psychotria emetica and Richardsonia scabra; the first of which is termed striated ipecacuanha—the second, undulated ipecacuanha (see p. 1030).

The root of Cephaëlis Ipecacuanha occurs in pieces of three or four inches long, and about the size of a small writing-quill; variously bent and contorted; simple or branched. It has a knotty appearance, in consequence of a number of deep circular fissures about a line in depth, and which extend inwardly to a central ligneous cord, so as to give the idea of a number of rings strung upon a thread (hence the name *annulated*). These rings are unequal in size, both with respect to each other and to different parts of the same ring. This root has a resinous fracture. Its substance consists of two parts: *one* called the *cortical portion*, which is brittle and resinous, of a horny appearance, with a grayish or brownish-gray colour—sometimes whitish; and a *second,* called *meditullium,* and which consists of a thin, yellowish-white, woody, vascular cord, running through the centre of each piece. In 100 parts of good ipecacuanha, there are about 80 of cortex and 20 of meditullium. Ipecacuanha root has an acrid, aromatic, somewhat bitter taste, and a slightly nauseous, but peculiar odour. The colour of the root varies somewhat, being brownish, reddish-brown, grayish-brown, or gray.

Richard (*op. cit.*), Merat (*Dict. des Scienc. Méd.* t. xxvi.; and *Dict. Mat. Méd.* iii.), and Guibourt (*Hist. des Drog.* i.) admit three varieties of annulated ipecacuanha, whose principal distinction is the colour of the epidermis. The age of the root, the nature of the soil, and the mode of drying, are among the different circumstances producing these varieties. Sometimes they are met with in the same bale.

Var. α. Brown Annulated Ipecacuanha, Richard; *Brown Ipecacuanha,* Lemery.—(*Radix ipecacuanhæ annulatæ fuscæ*). This is the best kind. The greater part of the ipecacuanha of commerce consists of this variety. Its epidermis is more or less deeply brown, sometimes even blackish; its fracture is gray, or brownish: its powder is gray. The cortical portion has a horny appearance. The root which I have received from Professor Guibourt, as *blackish gray ipecacuanha,* is somewhat less brown. It is the *gray* or *annulated ipecacuanha* of Merat.

I have occasionally found in commerce a *brown non-annulated* variety of ipecacuanha, imported in distinct bales. It consists of slender, cylindrical, often branched pieces, frequently several inches long, smooth, or slightly warty, but not annulated or moniliform, with a very thin cortex, and a woody meditullium of the usual size, or thicker. These pieces appear to be the subterraneous bases of the stems or runners. Occasionally pieces of the brown annulated ipecacuanha are found attached.

Var. β. Red Annulated Ipecacuanha, Richard.—This differs from the preceding by the lighter and reddish colour of its epidermis, by its less powerful odour, and by its want of aromatic taste. Sometimes it has, when broken, the same horny and semi-transparent quality of the brown ipecacuanha, but more frequently it is opaque, dull, and farinaceous; in which case it is generally less active. These differences probably depend on the nature of the soil in which the plant grew. The root which I have received from Professor Guibourt, under the name of *reddish gray annulated ipecacuanha,* is scarcely so red as the pieces which I have met with in English commerce. It is the *red-gray ipecacuanha* of Lemery and Merat.

Var. γ. Gray Annulated Ipecacuanha, Richard; *White-Gray Ipecacuanha,* Merat; *Greater Annulated Ipecacuanha,* Guibourt.—The colour of this variety is grayish-white. Professor Guibourt has met with it of a reddish-gray colour. Gray ipecacuanha occurs in pieces of larger diameter than either of the foregoing kinds, with fewer, more irregular, and less prominent rings. It is merely a portion of the root of the Cephaëlis, which has become more developed, either from meeting with excess of nourishment, or from some other circumstance.

I have found, in English commerce, a gray ipecacuanha, whose roots were not longer than the brown variety, but whose rings were imperfectly developed.

COMPOSITION.—The most important analyses of ipecacuanha are those of Pelletier (*Journ. de Pharm.* iii. 148), Richard and Barruel (*Ibid.* vi. 264), and Bucholz (Gmelin, *Handb. d. Chem.* ii. 1281).

Pelletier's Analyses.

	Brown Annulated Ipecacuanha. *Cortex.*	Brown Annulated Ipecacuanha. *Meditullium.*	Red do. *Cortex.*
Emetina	16	1·15	14
Odorous fatty matter	2	traces	2
Wax	6	—	—
Gum	10	5·00	16
Starch	42	20·00	18
Ligneous matter	20	66·60	48
Non-emetic extractive	0	2·45	—
Loss	4	4·80	2
Ipecacuanha	100	100·00	100

Bucholz's Analysis.

Emetic extractive [emetina]	4·13
Soft resin	2·43
Wax	0·75
Gum	25·17
Starch	9·00
Woody fibre	10·80
Bitter extractive	10·12
Sugar	2·00
Extractive, gum & starch, extracted by potash	34·80
Loss	0·80
Ipecacuanha	100·00

1. *Odorous fatty matter.*—It is extracted from ipecacuanha by ether. It is of a brownish-yellow colour, soluble in alcohol and ether, to both of which it communicates a yellow colour. Its odour is very strong, and similar to that of the essential oil of horse-radish: it becomes insupportable when heat is applied, but is weak and analogous to that of the ipecacuanha root when diluted. The taste is acrid; the specific gravity is greater than that of alcohol.

This fatty matter consists of two substances: 1st, *a very fugacious volatile substance*, which is the odorous principle of ipecacuanha root; 2dly, *a fixed fatty matter* (which some chemists have mistaken, when mixed with emetina, for resin), having little or no odour.

Notwithstanding its strong taste and odour, the fatty matter of this root does not seem to have any effect on the stomach. Given in large doses to animals, it had no sensible operation. Caventou took six grains at one time, but experienced no marked effects therefrom. Pelletier and Magendie swallowed some grains of it, and experienced a disagreeable impression on the throat, but it was temporary only.

2. *Emetina.*—When first discovered by Pelletier and Magendie, in 1817, it was termed *la matière vomitive*, or *emetine* (from ἐμέω, *I vomit*).

Pure emetina is white (when not absolutely pure it has a grayish-yellow tinge), pulverulent, inodorous, with a slightly bitter taste; fusible at 122° F.; very slightly soluble in cold, but much more so in hot, water; very soluble in alcohol, but scarcely soluble in ether and oils. It dissolves in acids, the acidity of which it does not entirely destroy. The *salts of emetina* are slightly acid, and very crystallizable. They form gummy masses, in some only of which are traces of crystallization occasionally found. Emetina restores the blue colour of litmus which has been reddened by an acid. I find that the yellowish-white emetina, sold in the shops under the name of pure emetina, is coloured red by nitric acid, the red colour being much deepened on the addition of ammonia. An alcoholic solution of iodine, added to an alcoholic solution of emetina, produces a reddish precipitate (*hydriodate of emetina?*). Tincture of galls copiously precipitates solutions of emetina (*tannate of emetina*). The effect of these reagents on emetina is similar to their effect on morphia; but from this last substance emetina is distinguished by the salts of iron, which produce no change of colour in it.

The following is the composition of emetina:—

	Eq.	*Eq. Wt.*	*Per Cent.*	*Dumas and Pelletier.*
Carbon	35	210	65·42	64.57
Hydrogen	25	25	7·79	7·77
Nitrogen	1	14	4·36	4·30
Oxygen	9	72	22·43	22·95
Emetina	1	321	100·00	99·59

The following are stated by Magendie (*Formulaire*, 95) as the effects of *impure* emetina:—From half a grain to two grains given to cats and dogs caused at first vomiting, then sleep. In doses of from six to ten grains, vomiting, sleep, and death, took place. Dissection shewed inflammation of the pulmonary tissue, and of the mucous membrane of the alimentary canal, from the cardia to the anus. The same effects (namely, vomiting, sleep, and death) were observed when impure emetina was dissolved in water, and injected into the jugular vein, into the pleura, into the anus, or into the muscular tissue. On man a quarter of a grain excited nausea and vomiting; a grain and a half, or two grains, taken fasting, caused continued vomiting, and decided disposition to sleep.

The effects of *pure* emetina are similar, but more energetic. In one case 1-16th of a grain caused vomiting in a man eighty-five years of age: two grains are sufficient to kill a dog.

Emetina has been proposed as a remedial agent,—as a substitute for ipecacuanha, all the advantages of which it is said to possess in a much smaller dose, and without the unpleasant taste and odour which the root is known to have. I confess, however, I think very little advantage is likely to be gained by the substitution. When we wish to give emetina in a liquid form, it may be readily dissolved in water by the aid of acetic or dilute sulphuric acid.

Chemical Characteristics.—A decoction of the root, filtered and allowed to cool, becomes, on the addition of a solution of free iodine, blue (*iodide of starch*). Tincture of nutgalls forms, in the decoction as well as in the tincture diluted with water, a grayish white precipitate (*tannate of emetina*). Sesquichloride of iron communicates a greenish tint (*tannate* [*gallate*, Pelletier] *of iron*) to the decoction as well as to the diluted tincture. A solution of isinglass forms in the infusion, after twelve hours, a precipitate (*tannate of gelatine*). Alcohol renders the decoction turbid (*gum*). Diacetate of lead forms with the tincture, and especially with the decoction, a precipitate (*colouring matter*, *gum*, and *oxide of lead*).

Physiological Effects.—If the powder or dust of ipecacuanha be applied to the eyes or face, it acts as an irritant, and causes redness and swelling of these parts. Inhaled, it irritates the respiratory passages, and, in some persons, brings on difficulty of breathing, similar to an attack of spasmodic asthma (Scott, *Phil. Trans.* for 1776, p. 168). Mr. Roberts, surgeon, at Dudley, is affected in this way; and I have received from him the following account of his case:—"If I remain in a room where the preparation of ipecacuanha is going on—for instance, making the pulv. ipecac. comp.—I am sure to have a regular attack of asthma. In a few seconds dyspnœa comes on in a violent degree, attended with wheezing and great weight and anxiety about the præcordia. The attack generally remains about an hour, but I obtain no relief until a copious expectoration takes place, which is invariably the case. After the attack is over I suffer no further inconvenience. I have always considered that the attack proceeds from the minute particles of the ipecacuanha floating in the atmosphere, acting as an irritant on the mucous membrane lining the trachea and bronchial tubes." In some cases the mere odour of the root seems sufficient to excite difficulty of breathing, with a feeling of suffocation.

There is one case recorded of poisoning by the incautious inhalation of the dust of ipecacuanha, in the process of powdering it, by a druggist's assistant. It is mentioned by Dr. Prieger (*Rust's Mag.* B. xxxii. H. i. S. 182). The patient, who was suffering with catarrh and cough, inhaled, during three hours, the dust from the root; in consequence of which vomiting came on, followed by a tightness at the chest. An hour after this he complained of a sense of suffocation, and constriction of the trachea and throat: his appearance was pale and deathly. The physician who was called in, bled him, and gave assafœtida and belladonna with temporary relief; but in five hours a fresh attack came on, with the most imminent danger of suffocation. A strong decoction of uva-ursi, with the extract of rhatany, was administered with almost immediate relief, and in an hour his breathing was much freer. He was able to leave the house in two days, but suffered several days with difficulty of breathing.

When taken *in small and repeated doses*, ipecacuanha principally directs its influence to the secreting organs, especially those of the chest, whose activity it promotes. It specifically affects the bronchial membrane, in some morbid conditions of which it promotes expectoration, while in others, attended with a profuse secretion of phlegm, it exerts a beneficial influence, and often contributes to the restoration of the part to its normal condition. *In somewhat larger doses* it creates nausea with its concomitant phenomena, depression, increased secretion of saliva and buccal mucus, &c. If a diaphoretic regimen be adopted, it exerts a powerfully relaxing influence over the skin. *In full medicinal doses* it occasions vomiting, followed by a tendency to sleep. Its operation as an emetic is exceedingly safe, since inflammation is not produced by it, even when an overdose has been swallowed.

The vomiting produced by ipecacuanha is not so violent as that induced by emetic tartar, neither is it so long continued, nor attended with such nausea. Furthermore, ipecacuanha is less disposed to act on the bowels. The tonic and astringent qualities of the zincic compounds, as well as their want of diaphoretic power, distinguish these emetic substances from ipecacuanha. Squill (with which ipecacuanha agrees in its expectorant and emetic qualities) is distinguished by its greater acridity, and by its influence not being concentrated on the pulmonary organs, as is the case with ipecacuanha, which does not, therefore, possess that power of stimulating the urinary organs possessed by squill (see pp. 653-4).

The most remarkable of the effects of ipecacuanha seem to be produced by the agency of the eighth pair of nerves. "How singular it is," says Dr. M. Hall (*Lectures in the "Lancet"* for April 21, 1838), "that ipecacuanha taken into the bronchia should excite asthma, and taken into the stomach should induce another affection of the respiratory system, vomiting." Sundelin (*Handb. d. sp. Heilmittell.* ii. 5) ascribes the red condition of the bronchial membrane, and the congestion of the lungs of animals killed by emetine, not to the specific stimulus exerted by this substance over the pulmonary mucous membrane, but to an exhausting stimulus over the eighth pair of nerves, by which a condition similar to suffocative catarrh (*Steckflus*) is brought on; for he has observed the same appearances in the bodies of persons who have died of this disease, where there was certainly no inflammatory condition of the bronchial membrane, but a paralytic condition of its small bloodvessels.

Uses.—Ipecacuanha is employed in full doses as an emetic, or in smaller doses as an expectorant and nauseant.

1. *In full doses, as an emetic.*—The mildness of its operation adapts ipecacuanha for the use of delicate and debilitated persons, where our object is merely to evacuate the contents of the stomach. Thus it is well fitted for the disorders of children requiring the use of emetics (as when the stomach is overloaded with food, in hooping-cough, croup, &c.) on account of the mildness and certainty of its action. It is also exceedingly useful for adults (especially delicate females); thus, in gastric disorders, to evacuate undigested acrid matters from the stomach,—to promote the passage of biliary calculi,—as a counter-irritant at the commencement of fevers,—in many inflammatory diseases (as acute mucous catarrh, cynanche, hernia humoralis, and ophthalmia),—in asthma,—and as an evacuant in cases of narcotic poisoning. When the indication is to excite gentle vomiting in very weak and debilitated frames, Dr. Pye (*Med. Obs. and Inq.* vol. i. 240) has shown it may be effected frequently with the utmost ease and safety by ipecacuanha in doses of from two to four grains. Dr. Cullen (*Mat. Med.* ii. 474) has expressed some doubt with respect to the correctness of this statement; but it is well known that ten grains of Dover's powder (containing one grain of ipecacuanha) not unfrequently causes vomiting.

The mildness of its operation is not the only ground for preferring ipecacuanha to other emetic substances. Its specific power over the pulmonary organs and the stomach leads us to prefer it in maladies of these parts, in which vomiting is likely to be beneficial; especially in those affections in which the nerves appear to be more than ordinarily involved, as in spasmodic asthma and hooping-cough. In the first of the complaints, Dr. Akenside (*Med. Trans.* i. 93) has shewn that it proves equally serviceable even when it fails to occasion vomiting, and merely produces nausea. He gave a scruple, in the paroxysm, to create vomiting, and, in the interval, five grains every morning, or ten grains every other morning. Dr. Wright (*Memoir of*, pp. 379 and 397) recommends gentle emetics of ipecacuanha at the commencement of the treatment of dysentery.

2. *In small doses as a nauseant, antispasmodic, diaphoretic, and expectorant.*—When given in doses insufficient to occasion vomiting, ipecacuanha is serviceable in several classes of complaints, especially those of the chest and alimentary canal.

(*a.*) *In Affections of the Respiratory Organs.*—Nauseating doses of ipecacuanha are used with considerable advantage in acute cases of *mucous catarrh.* They favour expectoration, and relaxation of the cutaneous vessels. In milder and more chronic forms, smaller doses, which do not occasion nausea, will be sufficient. In children, who bear vomiting much better than adults, full nauseating or even emetic doses are to be preferred.

"When a child becomes hoarse, and begins to cough," says Dr. Cheyne (*Cyclop. of Prac. Med.*, art. *Croup*, vol. i. p. 496), "let every kind of stimulating food be withdrawn; let him be confined to an apartment of agreeable warmth; have a tepid bath; and take a drachm of the following mixture every hour, or every two hours, if it produces sickness:—℞ Vini Ipecacuanhæ, ʒiij.; Syrupi Tolut. ʒv.; Mucil. Acaciæ, ℥j. M.; and all danger will probably be averted. Whereas, if no change be made in the quality of the food, and if he be sent into the open air, he will probably undergo an attack of bronchitis or croup."

In *hooping-cough*, in which disease considerable benefit is obtained by the use of emetic substances, ipecacuanha is frequently administered with advantage. After giving it to create vomiting, it should be administered in nauseating doses. In *asthma*, benefit is obtained by it, not only when given so as to occasion nausea and vomiting, as above noticed, but also in small and repeated doses. In both this and the preceding disease, the benefit procured by the use of ipecacuanha arises, not from the mere expectorant or nauseating operation alone of this remedy, but from its influence otherwise over the eighth pair of nerves. In *bronchial hemorrhage* (hæmoptysis) the efficacy of ipecacuanha has been greatly commended. A. N. Aasheim (*Vis anthæmopt. rad. ipec.* in *Acta Reg. Soc. Med. Hafn.* i. 170), a Danish physician, gave it in doses of one-fourth of a grain every three hours during the day, and every four hours during the night. In this way it excites nausea, and sometimes even vomiting. It checks the hemorrhage, alleviates the cough, and relaxes the skin.

(*b.*) *In Affections of the Alimentary Canal.*—In *indigestion*, Daubenton (*Mém. sur les Indigest.* 1798) gave it in doses just sufficient to excite a slight sensation of vermicular motion of the stomach, without carrying it to the point of nausea. Eberle (*Treat. of the Mat. Med.* i. 44, 2d ed.) tried it, in his own case, with evident advantage. An anti-emetic quality has been assigned to it by Schönheider (*Acta Reg. Soc. Hafn.* ii. 139.) In *dysentery*, ipecacuanha has gained no trifling celebrity, whence its name of *radix antidysenterica*. In severe forms of the disease no one, I suspect, now would think of relying on it as his principal remedy; but as an auxiliary, its efficacy is not to be denied. The advocates for its use, however, are not agreed as to the best mode of using it. Sir George Baker (*De Dysenteria*, 1761), and Dr. Cullen (*Mat. Med.* ii. 477), consider it to be of most benefit where it acts as a purgative, but this can scarcely be its *methodus modendi*. From my own observations of its use in the milder forms of dysentery met with in this country, I am disposed to ascribe its efficacy in part to its diaphoretic powers, since I have always seen it promoted by conjoining a diaphoretic regimen. But its tendency to produce an antiperistaltic movement of the intestines doubtless contributes to its antidysenteric property. It is best given, I think, in conjunction with opium, (of course depletion proportional to the violence of the disease and the strength of the patient preceding its use). Its determination to the skin should be promoted by warm clothing, and the free use of mild, tepid aliments. Mr. Twining (*Trans. of the Med. and Phys. Soc. of Calcutta*, vol. iv. p. 170) gave ipecacuanha in large doses (grs. vj.), with extract of gentian, without causing vomiting. Mr. Playfair (*Ed. Med. and Surg. Journal*, vol. ix. p. 18), recommends from half a drachm to a drachm of ipecacuanha, with from thirty to sixty drops of laudanum, to be given at the commencement of the disease.

(*c.*) *In various other maladies.*—As a sudorific, ipecacuanha is given in combination with opium, (see *Pulvis Ipecacuanhæ compositus*) in various diseases. On the continent it is esteemed as an antispasmodic. In uterine hemorrhage also it has been employed. In chronic visceral enlargements it has been administered as a resolvent.

Administration.—The usual dose of ipecacuanha, in *powder*, as an *emetic*, is grs. xv. But a much smaller quantity (for example, six, or four, or even two grains) will frequently suffice, as I have before mentioned. But a scruple, or half a drachm, may be taken with perfect safety. A commonly-used emetic consists of one grain of emetic tartar, and ten or fifteen grains of ipecacuanha. For infants, half a grain or a grain of this root is usually sufficient to occasion vomiting. In all cases, the operation of the remedy should be assisted by diluents. As a *nauseant* the dose is from one to three grains. As an *expectorant* and *sudorific*, the dose should not exceed one grain: for infants, one-quarter or one-eighth of a grain. *Ipecacuanha lozenges* contain usually from a quarter to half a grain of the powder, and may be used in catarrhal affections to promote expectoration. *Infusion of ipecacuanha* (prepared by digesting ℈ij. of the coarsely-powdered root in f℥vj. of boiling water) may be used as an emetic, in cases of narcotic poisoning, in doses of f℥j. to f℥ij.

1. Vinum Ipecacuanhæ, L. E. D. (Ipecacuanha, bruised, ℥ijss.; Sherry Wine, Oij. Macerate for fourteen [seven *E.*] days, and strain.) The relative proportions of the ingredients used are the same in all the British Pharmacopœias, though the actual quantities are dissimilar. According to Dr. A. T. Thomson, a pint (*i. e.* f℥xvj.) of wine takes up 100 grains of the soluble matter of ipecacuanha. This preparation is diaphoretic, expectorant, and emetic. Dose, for an adult, as a diaphoretic and expectorant, ♏x. to ♏xl.; as an emetic, f℥ij. to f℥iv. On account of the mildness of its operation, it is given, as an emetic, to children: the dose is from ♏xx. to f℥i.; according to the age of the child.

It is also exceedingly useful as an expectorant in the diseases of infants: dose from ♏v. to ♏x.

2. *Syrupus Ipecacuanhæ*, E. (Ipecacuanha, in coarse powder, ℥iv.; Rectified Spirit, Oj.; Proof Spirit and Water, of each f℥xiv.; Syrup, Ovij. Digest the ipecacuanha in four fluidounces of the rectified spirit, at a gentle heat, for twenty-four hours; strain and squeeze the liquor, and filter. Repeat this process with the residuum and proof spirit; and again with the water. Unite the fluids, and distil off the spirit till the residuum amount to twelve ounces; add to the residuum five fluidounces of rectified spirit, and then the syrup.) A syrup of ipecacuanha is a very useful preparation for children; but some difficulties attend its preparation.

An aqueous decoction of this root contains so much starch that it can scarcely be filtered. Even the infusion filters slowly, is always turbid, and yields a syrup which does not keep well. Hence MM. Guibourt and Henry (*Pharm. Raison.* i. 502, 2d ed.) introduced a process, of which that of the Edinburgh Pharmacopœia is a modification (improvement?) They prepared an alcoholic extract, which is dissolved in water and mixed with concentrated syrup. About two fluidscruples of the Edinburgh preparation contain the strength of one grain of ipecacuanha; hence the dose of it, as an *emetic*, for infants, will be half a tea-spoonful; for adults, f℥j. or fʒiss. As an *expectorant*, the dose is fʒj. to fʒij.

3. *Pulvis Ipecacuanhæ compositus*, L. E. D. *Dover's Powder; Pulvis Doveri*, offic. (Ipecacuanha, powdered; Hard Opium, powdered, of each ʒj.; Sulphate of Potash, powdered, ℥j. Mix them. The proportions used by all the British Colleges are the same. The *Dublin College* directs the Sulphate of Potash to be rubbed with the Opium, and the Ipecacuanha to be then intermixed). This preparation is an imitation, (though not a very exact one) of a formula given by Dover, (*The ancient Physician's Legacy to his Country*, p. 14, 1733); whence it is commonly known in the shops as *Dover's Powder*. The following is Dr. Dover's recipe:—

> "Take opium, ℥j.; saltpetre; tartar vitriolated, of each ℥iv.; ipecacuan, ℥j.; liquorice, ℥j. Put the saltpetre and tartar into a red hot mortar, stirring them with a spoon until they have done flaming. Then powder them very fine. After that slice in your opium; grind these to a powder, and then mix the other powders with them. *Dose*, from 40 to 60 or 70 grs. in a glass of white wine posset, going to bed. Covering up warm, and drinking a quart or three pints of the posset drink while sweating."

The compound powder of ipecacuanha is one of our most certain, powerful, and valuable sudorifics. The sulphate of potash is intended to serve the double purpose of promoting the sudorific operation of the other ingredients, and of minutely dividing, by the hardness of its particles, the opium and ipecacuanha. The nitrate of potash also employed by Dr. Dover probably contributed still further to the sudorific effect of the powder. The opium and ipecacuanha combined, enjoy great sudorific properties not possessed by either of these substances individually. I am inclined, however, to ascribe the greater part of the activity of the compound to the opium, which it is well known strongly determines to the cutaneous surface (see Opium), and often produces pricking or itching of the skin; and when assisted by the copious use of warm aqueous diluents, operates as a sudorific. This effect, however, is greatly promoted by the ipecacuanha, which has a relaxing influence over the cutaneous vessels. The use of the posset, enjoined by Dr. Dover, is an important part of the sudorific plan. The contraindications for the use of compound powder of ipecacuanha are an irritable condition of the stomach (when this preparation is apt to occasion sickness), and cerebral disorder. Thus, in fever, a dry furred tongue and a dry skin, with much disorder of the cerebro-spinal functions, it, like other opiates, is calculated to prove most injurious. In such cases, the antimonial sudorifics may be resorted to (see p. 418). But when the tongue is moist, the skin, if not damp, at least soft, and the functions of the brain not much involved, it will probably operate beneficially. In slight colds, catarrhs, and rheumatic pains, it often proves most effectual. In various inflammatory affections, when the febrile excitement does not run too high, and when the brain is undisturbed, it may be used with good effect. In acute rheumatism, it is occasionally highly serviceable. In diarrhœa and dysentery also. In hemorrhages from internal organs, as the uterus, it is useful on the principle of revulsion or counter-irritation (see p. 45), by its power of determining to the skin. The dose of this preparation is usually from grs. v. to grs. x., given in currant jelly or gruel, or made into a pill (see *Pilulæ Ipecacuanhæ et Opii*), or administered in a common saline draught. Where the stomach is irritable, I have frequently seen five grains cause sickness. On the other hand, in some cases where a powerful sudorific is required, and the head quite free, grs. xv. or even ℈j. of this powder are not unfrequently given.

4. *Pilulæ Ipecacuanhæ et Opii*, E. (Powder of Ipecacuanha and Opium, ℥iss.; Conserve of Red Roses, ℥ss.; beat them into a proper mass, which is to be divided into twenty-four pills). Each pill contains three grains and three quarters of the *compound powder of ipecacuanha*, equal to three-eighths of a grain of opium, and the like quantity of ipecacuanha. Dose, one to three pills.

Unca'ria Gam'bier, Roxburgh.—*The Gambir.*

Nau'clea Gam'bir, *Hunter.*

Sex. Syst. Pentandria, Monogynia.

(The extract obtained from the leaves; Gambir, or Gambir-Catechu.)

History.—*Gambier* or *Gambir* is the Malay name of an extract obtained from the leaves of this shrub. Rumphius (*Herb. Amboin.* vol. v. tab. 34) has described the plant under the name of *Funis uncatus* or *Daun Gatta Gambir.*

Botany. *Gen. Char.*—Limb of *calyx* short, urceolate, five-cleft. *Corolla* funnel-shaped; tube slender; throat naked; lobes five, spreading, oval-oblong. *Anthers* enclosed or protruded. *Style* filiform, protruded; *stigma* tumid, undivided. *Capsules* pedicellate, clavate, tapering to the base. *Seeds* numerous, imbricated, winged.—Climbing *shrubs. Peduncles* when old becoming axillary compressed hooked spines. *Flowers* in loose heads (Lindley; D. C.)

Sp. Char.—*Branches* terete. *Leaves* ovate-lanceolate, acute, with short petioles, smooth on both sides. *Stipules* ovate. *Peduncles* axillary, solitary, opposite, bracteolated about the middle; the lowest ones sterile, converted into hooked spines (D. C.)

A stout, scandent *shrub.* *Florets* green and pink. *Capsules* stalked, clavate, two-celled, two-valved.

HAB.—Islands of East Indian Archipelago. Extensively cultivated. On the Island of Bintang there are 60,000 *Gambir plantations* (Bennett's *Wanderings*, ii.)

EXTRACTION OF GAMBIR.—Two methods of obtaining Gambir are described: *one* consists in boiling the leaves in water, and inspissating the decoction; the *other*, which yields the best Gambir, consists in infusing the leaves in warm water, by which a fecula is obtained, which is inspissated by the heat of the sun, and formed into cakes, (*Asiatic Research.* xi. 188).

Dr. Campbell (Roxburgh, *Fl. Ind.* i. 518) has described the method of making the *circular* or *cylindrical* variety of Gambier, as followed in the colony established by the Sultan of Moco, where the manufacture is carried on to a considerable extent. It consists in shredding and bruising the young shoot and leaves "in water for some hours, until a fecula is deposited; this, inspissated in the sun to the consistence of a paste, is thrown into moulds of a circular form, and in this state the Gambier is brought to market." Dr. Roxburgh (*Ibid.*) describes the manufacture of the *cubical* variety as practised eastward to the Bay of Bengal. The process consists in "boiling the leaves and young shoots; evaporating the decoction by fire and the heat of the sun. When sufficiently inspissated, it is spread out thin, and cut into little square cakes, and dried."

Mr. Bennett (*Wanderings*, ii. 183) has given a very full account of the method of making the *cubical* variety as practised at Singapore. The leaves are plucked from the prunings, and boiled in a *qualie*, or cauldron (made of bark, with an iron bottom); after being boiled twice and rinsed, they are used as a manure for the pepper vine. The decoction is evaporated to the consistence of a very thick extract, of a light, yellowish, brown colour, like clay, which is placed in oblong moulds. The pieces thus obtained are divided into squares, and dried in the sun on a raised platform. Hunter (*Linn. Trans.* ix.) says Sago is often intermixed with the extract, but Bennett denies that this is done at Singapore. The best Gambier is made at Rhio, in the isle of Bintang; the next best is that of Lingin.

COMMERCE.—Gambir (the cubical variety) is imported from Singapore principally. Its principal use here is for tanning; and among dealers it is distinguished from catechu, cutch, &c. by the name of *terra japonica.* The following are the quantities imported during the last four years (Messrs. Powell's *Annual Price Current* for 1840):—

In 1836	970 tons.	In 1838	1600 tons.
1837	2738	1839	5213.

During the last three years, its price has varied from 15*s.* to 26*s.* per cwt. The duty on it is 1*s.* per cwt. It is brought over in cane baskets, lined with palm leaves. Mr. Bennett says they are made of a kind of rattan found in the jungle at Singapore.

DESCRIPTION AND VARIETIES.—*Gambir* (*Terra Japonica*, of tanners; *Catechu in square cakes*, of druggists; *Cubical Resinous Catechu*, of Guibourt; *Gambier of Second Quality*, Bennett, *Med. and Phys. Journ.* vol. lxvii.) occurs in cubes, whose faces are about one inch square. When thrown into water, it floats. These cubes are externally of a deep reddish or yellowish brown colour; their fracture is dull and porous, and internally their colour is paler than that of their surface, being yellowish cinnamon brown; the fractured surface not unfrequently presenting some darker feebly shining stripes, extending from without inwards. This kind has no odour; its taste is powerfully astringent, bitter, but subsequently becoming sweetish. It melts entirely in the mouth. When heated in a platinum crucible it undergoes a kind of semifusion, and swells up; and when incinerated leaves a light white ash. Nees v. Esenbeck (*Handb. d. med. pharm. Botan.* i. 881) says twenty grains of this Gambir leave only half a grain of ash. When digested in cold water it almost wholly dissolves, leaving behind a resinous substance, fusible in boiling water, and soluble in alcohol. Examined by the microscope, Gambir is found to consist in great part of myriads of minute crystals (*catechuic acid*) intermixed with a kind of mucous tissue.

Mr. Bennett (*Med. and Phys. Journ.* lxvii.) has described three qualities of Gambir, specimens of which are contained in the collection of the *Medico-Botanical Society of London.* To these I must add a fourth, which I have received from Professor Guibourt.

1. *Small Circular Stamped Gambir: Gambir of the first quality*, Bennett.—This occurs in small round cakes, about the size of a small lozenge. Its form is something like that of a plano-convex lens, slightly flattened on the convex side. One of its surfaces is flat, round, about half an inch in diameter; the other one is convex, with a star-like pattern impressed on it. Its colour is pale pinkish yellowish white. It has a chalky or earthy feel, and is brittle.

2. *Gambir of the second quality*, Bennett.—This occurs in two forms: *cubes* (forming the Gambir of English commerce, described in the text), and *square prisms* or *oblong pieces.* The length of the prisms is two inches; the size of the terminal faces half an inch square. In other respects, the oblong variety agrees with the square kind.

3. *Cylindrical Gambir: Gambir of third quality*, Bennett.—This occurs in short cylindrical pieces, the length of the cylinder being only about one-third of an inch, while its diameter is one inch and a quarter. One of the round surfaces is marked with the fibres of a cloth, on which the cakes have been dried. The colour internally is pale, dull, pinkish yellow, externally being a shade darker. Its fracture is dull and porous. It is easily scraped to powder with the nail, and in this state has a chalky feel. Its taste is astringent, but less so than the other kinds; it is gritty under the teeth. It sinks in water. The samples in the *Medico-Botanical Society* are somewhat smaller than those which I have found in commerce. This kind contains many impurities.

4. *Cubical Amylaceous Gambir.*—It is in cubes, which swim in water, and whose faces are about half an inch square. Externally these cubes are dark brown, being darker coloured than the kind just described. Its fracture is dull and porous, its colour internally being pale cinnamon brown. It is readily distinguished from all other kinds of Gambir, by the black colour produced when the tincture of iodine is applied to the fractured surface. When digested in water it is resolved into two parts—

Matter soluble in water	45
Matter insoluble in water, principally amylaceous................	55
	100

The amylaceous matter is probably sago.

Composition.—Gambir (the cubical variety) was analyzed by Nees v. Esenbeck (*Pharm. Centr.-Blatt. für* 1830, 45), who found *Tannin* 36 to 40 per cent., *Peculiar Matter* (Catechuic Acid), *Gum* or *Gummy Extractive, Tannic Deposit* (similar to red cinchonic), and $2\frac{1}{2}$ per cent. of *Woody Fibre.*

1. *Tannic Acid.*—The properties of this acid have been before (p. 735), described. That extracted from Gambir is soluble in water, alcohol, and ether, and gives a green colour to the salts of iron.

2. *Catechuic Acid; Tanningensäure.* Buchner; *Resinous Tannin*, Nees; *Catechin*, Pfaff. When Gambir is treated with cold water, an insoluble residuum is left: this is

impure Catechuic Acid, and was termed by Nees, *Resinous Tannin.* When obtained quite pure, it is a white, light powder, having a peculiar sweet taste. It is very slightly soluble only in cold water, more so in boiling water. Ether, and especially alcohol, are better solvents for it. It produces a green colour with the salts of iron, but does not precipitate gelatinous solution. Its composition is C^{15} H^5 O^5. If catechuic acid be digested in caustic potash, and the solution exposed to the air, oxygen is absorbed, and the catechuic acid is converted into *Japonic Acid*, composed of C^{12} H^4 O^4. But if catechuic acid be dissolved in carbonate of potash, and exposed to the air without heat, it is converted into *Rubinic Acid*, composed of C^{18} H^6 O^9.

Physiological Effects.—Gambir is one of the most powerful of the *pure astringents*, whose effects have been before described (see p. 79-80). Its sweet taste depends, in part at least, on catechuic acid.

Uses.—It is employed by druggists as catechu (see *Acacia Catechu.*)

Ru'bia tincto'rum, Linn. D.—*Dyer's Madder.*

Sex. Syst. Tetrandria, Monogynia.

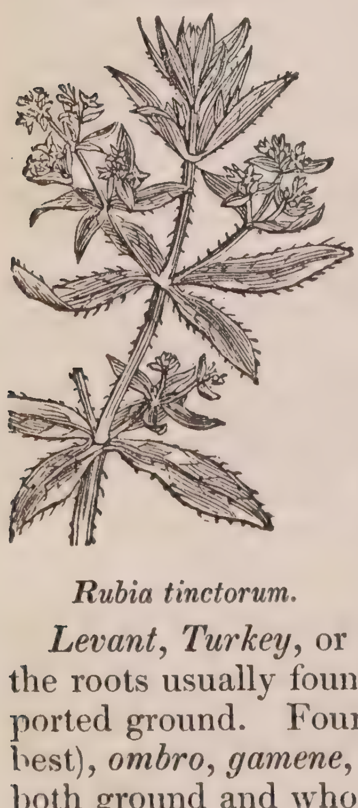
(Radix, *D.*)

History.—Madder (ἐρυθρόδανον) was employed in medicine by Hippocrates (ed. Fæs. 407 and 634). Theophrastus (*Hist. Plant.* ix. 14), Dioscorides (lib. iii. cap. 160), and Pliny (*Hist. Nat.* lib. xxiv. cap. 66 and 68, ed. Valp.) also mention this substance. In the middle ages it was called *varantia* (Beckmann, *Hist. of Invent. and Discov.* iii. 275).

Botany. *Gen. Char.*—Tube of the *calyx* ovate-globose; limb scarcely any. *Corolla* five-partite, rotate. *Stamens* short. *Styles* two, short. *Fruit* didymous, somewhat globose, baccate, juicy (D. C.)

Sp. Char.—Herbaceous. *Leaves* four to six in a whorl, somewhat petiolate, lanceolate, smooth above; their margin and keel, as well as the angles of the *stem* aculeate, rough. *Peduncles* axillary, trichotomous. Lobes of the *corolla* gradually callous-acuminate, not cuspidate (D. C.)

Fig. 192.



Rubia tinctorum.

Root perennial, horizontal, long, crouching, reddish brown. *Stems* several, herbaceous, tetragonal, with hooked prickles. *Leaves* somewhat membranous. *Flowers* small, yellow.

Hab.—Levant and south of Europe.

Description and Varieties. — Madder roots (*radix rubiæ tinctorum*) are long, cylindrical, about the thickness of a writing quill, branched, externally deep reddish brown. They consist of an easily separable cortex, whose epidermis is thin, and of a ligneous meditullium, which in the fresh state is yellow, but by drying becomes reddish. The odour of the root is feeble; the taste is bitter and astringent.

Levant, Turkey, or *Smyrna Madder* is imported whole, and constitutes the roots usually found in the shops. *Dutch* or *Zealand Madder* is imported ground. Four kinds of the powder are distinguished: *crop* (the best), *ombro*, *gamene*, and *mull* (the worst). *French Madder* is imported both ground and whole; it is produced in the environs of Avignon and Alsace. Small quantities of *Spanish Madder* are imported. The substance termed *East India Madder*, or *Munjeet*, is the root of *Rubia Munjista*, Roxb.

Composition.—Several analyses of madder have been made, viz. by

Bucholz (Gmelin, *Handb. d. Chem.* ii. 1280), John (*Ibid.*) and Kuhlmann (*Ann. Chim. et Phys.* xxiv. 225).

Bucholz.	
Resinous red colouring matter	1·2
Extractive ditto	39·0
Reddish brown substance, soluble in potash and hot alcohol	1·9
A pungent extractive	0·6
Gummy matter	9·0
Woody fibre	22 5
Matter soluble in potash	4·6
Vegetable salts of lime, with colouring matter	1·8
Water	12·0
Loss	7·4
Madder root	100·0

Kuhlmann.
Red colouring matter
Yellow ditto (*Xanthin*)
Mucilage
Nitrogenous matter
Bitter substance
Gum
Sugar
Woody fibre
Vegetable acid
Porous resin
Salts in the ashes.
Madder root.

The nature of the colouring matters of madder has been farther investigated by Robiquet and Colin (*Ann. Chim. et Phys.* xxxiv. 225), by Gaultier de Claubry and Persoz (*Ibid.* xlviii. 69), and by Runge (*Records of Science*, ii. 452, and iii. 44 and 135). According to the last mentioned chemist, there are no less than five colouring matters in madder. The same chemist mentions two colourless acids of madder; viz. *Madderic* and *Rubiacic Acids.* The colouring matters are as follows:—

1. *Madder Purple* (? *Purpurin*, Robiquet and Colin).—An orange-yellow crystalline powder. It is slightly soluble in cold water, very readily so in alcohol and ether. A strong solution of alum dissolves it. Alkalies dissolve it, forming cherry-red solutions. The colours which it imparts to mordanted tissues are less permanent than those produced by madder-red.

2. *Madder Red* (? *Alizarin*, Robiquet and Colin).—Is red, insipid, odourless, crystallizable by sublimation, insoluble in a strong solution of alum, almost insoluble in cold water, but is soluble in alcohol and ether. Alkalies dissolve it, forming violet-coloured solutions. It dyes cloths, which have been mordanted, red. Its composition is $C^{37}\ H^{12}\ O^{10}$.

3. *Madder Orange.*—Is very soluble in ether, sparingly so in cold alcohol. If water be added to a hot solution in spirit, crystals are deposited.

4. *Madder Yellow* (? *Xanthin*, Kuhlmann).—It is very soluble in water and alcohol. It has no affinity for cotton impregnated with the alum mordant.

5. *Madder Brown.*—Not being valuable as a dye-stuff, it has not been carefully examined.

Physiological Effects.—The influence of madder over the system is exceedingly slight. Its topical effect is scarcely obvious. Home (*Clin. Experiments*, p. 422, 2d ed.) ascribed to it emmenagogue qualities. Others have declared it to be diuretic. Neither of these effects, however, were observed by Dr. Cullen (*Mat. Med.*) It may, perhaps, possess mild, astringent, and tonic properties.

But the most remarkable physiological effect of madder is that of colouring the bones of animals fed with it, red. This fact was noticed by Belcher *Phil. Trans.* vol. xxxix.); though Beckmann (*Hist. of Invent. and Discov.* iii. 279) has adduced evidence to prove that some hints of it are to be found in the works of the ancients. This effect on the bones is produced in a much shorter time in young than in old animals. In birds, the beak and claws become coloured. As the nerves, cartilages, aponeuroses, tendons, and periosteum are not tinged, the effect is ascribed to the chemical affinity of the phosphate of lime for this colouring matter. Mr. Gibson (*Manchester Memoirs*, i. 146, 2d Ser.) accounts for it as follows:—The blood charged with the red particles imparts its super-abundance of them to the phosphate as it circulates through the bones. But as soon as the blood is freed from the madder by excretion, the serum then attracts the colouring matter, and in a little time entirely abstracts it. Tiedemann and Gmelin (*Vers. ü. d. Wegen auf welch. Subst.* S. 7) could not detect the colouring matter in the chyle; and the red tint of the serum prevented them ascertaining its existence in the blood, though of this scarcely a doubt can exist, inasmuch as it has been found in the excretions (for example, urine, milk, and sweat).

USES.—It was formerly a favourite remedy in jaundice, in which disease Sydenham used it (Sydenham's *Works*, by Dr. Pechey, p. 150, 4th ed. 1705). On account of its capability of tinging the bodies red, it has been recommended in rickets and mollities ossium, on the supposition of its promoting the deposition of bone earth (*Journ. de Méd.* t. xxxvii. 1772); but this notion appears to be groundless. Home (*Clin. Exper.*) employed it as an emmenagogue in uterine complaints. The *dose* of it is ʒss. to ʒij. three or four times a day.

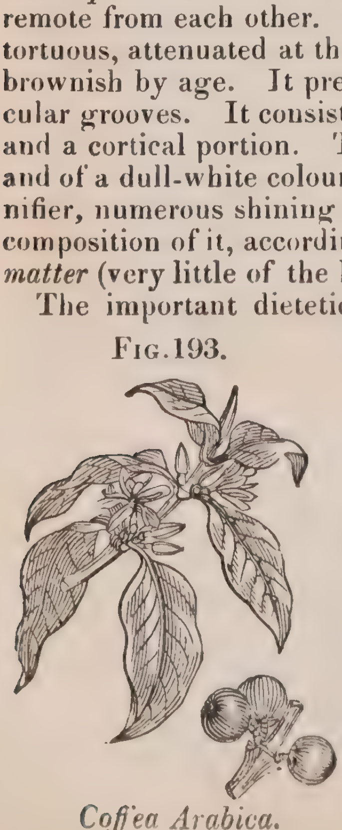
Other Medicinal and Dietetical Rubiaceæ.

Psycho'tria emet'ica is a native of Colombia, Peru, and probably of other parts of South America. Its roots constitute the *striated ipecacuanha* of Richard, Guibourt, and Merat; the *black* or *Peruvian ipecacuanha* of some other authors. They are neither annulated nor undulated, but longitudinally striated. They have deep circular intersections at various distances, giving them the appearance of being articulated; and when slight force is used, they fracture at these parts. As met with in commerce, they have externally a blackish-gray colour, with a brownish tinge; but when fresh, they are said to be dirty reddish-gray. Their fracture is resinous: the meditullium, or central ligneous cord, is yellowish, and perforated by numerous holes, which are very visible by a magnifier: the cortical portion is softish, easily separable, and of a grayish-black colour, becoming much deeper when moistened Its powder is deep gray. According to the analysis of Pelletier, this root consists of—*emetina* 9, *fatty matter* 12, *gallic acid* a trace, *gum, starch*, and *ligneous matter* 79.

Richardso'nia sca'bra (*R. braziliensis*, Gomez) is a native of the Brazils, New Granada, Peru, &c. Its root is the *undulated ipecacuanha* of Guibourt; the *amylaceous* or *white ipecacuanha* of Merat. It has a jointed appearance, from constrictions which are remote from each other. It is about the same size as that of the annulated species; is tortuous, attenuated at the extremities; externally of a grayish-white colour, becoming brownish by age. It presents no rings, properly so called, but is marked by semicircular grooves. It consists, like the annulated species, of a thin yellowish meditullium, and a cortical portion. The fracture of the root is not at all resinous, but farinaceous, and of a dull-white colour: the fractured surface presenting, when examined by a magnifier, numerous shining pearly, probably amylaceous, spots. The odour is musty. The composition of it, according to Pelletier, is *emetina* 6, *fatty matter* 2, *starch* and *ligneous matter* (very little of the latter) 92.

The important dietetical uses of *coffee* (*semina coffeæ*), the albumen of the seed of *Coffea arabica*, demands a short notice. The coffee plant is a native of Arabia Felix and Ethiopia, but is extensively cultivated in Asia and America. It is an ever-green *shrub*, from 15 to 20 feet high, with oblong-ovate, acuminate, smooth *leaves*, a five-toothed *calyx*, a white tubular *corolla*, with a five-parted spreading limb, five *stamina*, one *pistil* with a bifid style, and an oval, succulent, blackish-red or purplish two-seeded *berry*. The *seeds* are inclosed in a membranous endocarp (the parchment-like putamen of some botanists), and consist of a horny, yellow, bluish or greenish albumen, which is on one side flat with a longitudinal furrow, on the other convex. At one end of the seed is the embryo, with its cordiform cotyledons. The *dried berries* were imported from Demerara in 1839. Occasionally the seeds contained in their endocarp (*coffee in the husk*) are met with in commerce.

FIG. 193.



Coffea Arabica.

The varieties of *coffee* are distinguished in commerce according to their places of growth; but considered with reference to their physical properties, they are characterized by colour (yellow, bluish, or greenish) and size (the smallest seeds are about three lines long and two broad, the largest five lines long and two lines and-a-half broad). *Arabian* or *Mocha Coffee* is small, and dark yellow. *Java* and *East India* (Malabar) kinds are larger, and paler yellow. The *Ceylon* is more analogous to the *West India* kinds (Jamaica, Berbice, Demerara, Dominica, Barbadoes, &c.), which, as well as the *Brazilian*, have a bluish or greenish gray tint. *Roasted Coffee* (*semina coffeæ tosta*) is, when ground, extensively adulterated with chicory. The mode of detecting this fraud has been already (p. 968) pointed out. The presence of *roasted corn* may be detected by the blue colour produced on the addition of a solution of iodine to the cold decoction. Coffee, in both the raw and roasted states, has been the subject of repeated chemical investigations (see Thomson's *Org. Chem.* p. 98); but the results hitherto obtained can scarcely be considered satisfactory. The distilled water of coffee offers traces of *a volatile oil*. Pfaff declares that the aroma of roasted coffee depends on the volatilization, or rather decomposition, of a peculiar acid contained in raw coffee, and which has been denominated *caffeic acid*. The same authority gives for the composition of this acid—Carbon 29·1, Hydrogen 6·9, and Oxygen 6·4. Zenneck, however, asserts, that the aromatic principle of roasted coffee is neither acid nor alkaline. It is, probably, *a volatile oil* generated during torrefaction, though it is not known what constituent of the raw coffee produces it. *Caffein* is a volatile, crystalline, neutral constituent of coffee. Its composition is $C^4\ H^{2\frac{1}{2}}\ N\ O$. The decoction of coffee is coloured green by the persalts of iron, probably in consequence of the presence of *catechuic acid*. By the action of alkalies on a volatile principle of coffee, a green substance is produced, called *coffee green*. The other constituents of coffee are—*gum*, *resin*, *fixed oil*, *extractive*, *albumen*, and *lignin*.

The following is a comparative analysis of raw and roasted Martinico coffee made by Schrader:—

Raw Coffee.		*Roasted Coffee.*	
Peculiar coffee-principle	17·58	Coffee-principle	12·50
Gummy and mucilaginous extract	3·64	Extractive	4·80
Extractive	0·62	Gum and mucilage	10·42
Resin	0·41	Oil and resin	2·08
Fatty oil	0·52	Solid residue	68·75
Solid residue	66·66	Loss	1·45
Loss (water?)	10·57		
	100·00		100·00

Raw coffee must be slightly nutritious, on account of the gum and other nutritive principles which it contains. Rasori employed it, like powdered bark, in intermittent fever; and Grindel used it, in other cases, also as a substitute for cinchona. By roasting, its nutritive principles are (for the most part) destroyed, while the empyreumatic matters developed communicate a stimulant influence with respect to the nervous system.

Roasted coffee possesses powerfully anti-soporific properties; hence its use as a drink by those who desire nocturnal study, and as an antidote to counteract the effects of opium, and other narcotics, and to relieve intoxication. In those unaccustomed to its use it is apt to occasion thirst and constipation. I know a lady on whom it acts as a purgative. It is sometimes very useful in relieving headache. It has also been employed as a febrifuge, in intermittents; as a stomachic, in some forms of dyspepsia; as an astringent, in diarrhœa; and as a stimulant to the cerebro-spinal system, in some nervous disorders. Floyer, Dr. Percival, and others, have used it in spasmodic asthma; and Laennec (*Treat. on Diseases of the Chest*, by Forbes, 2d ed. p. 418) says, "I have myself seen several cases in which coffee was really useful."

ORDER 50. CAPRIFOLIA'CEÆ, *Jussieu.*—THE HONEYSUCKLE TRIBE.

ESSENTIAL CHARACTER.—*Calyx* superior, four- or five-cleft, usually with two or more bracts at its base. *Corolla* superior, monopetalous or polypetalous, rotate or tubular, regular or irregular. *Stamens* epipetalous, equal in number to the lobes of the corolla, and alternate with them. *Ovary* with from one to three or four cells, one of which is often monospermous, the others polyspermous: in the former the ovule is pendulous; *style* one; *stigmas* one, or three to four. *Fruit* indehiscent, one- or more-celled, either dry, fleshy, or succulent, crowned by the persistent lobes of the calyx. *Seeds* either solitary and pendulous, or numerous and attached to the axis; *testa* often long; *embryo* straight, in fleshy albumen; *radicle* next the hilum.—*Shrubs* or *herbaceous* plants, with opposite *leaves*, destitute of *stipules*. *Flowers* usually corymbose, and often sweet-scented (Lindley).

PROPERTIES.—Not uniform.

Sambu'cus ni'gra, Linn. L. E. D.—*Common Elder.*

Sex. Syst. Pentandria, Trigynia.

(Flores, *L.*—Flowers, *E.*—Flores. Baccæ. Cortex interior, *D.*)

HISTORY.—Hippocrates employed the elder (ἀκτή) in medicine.

BOTANY. *GEN. CHAR.*—Limb of the *calyx* small, five-cleft. *Corolla* rotate, pitcher-shaped, five-cleft; its lobes obtuse. *Stamens* five. *Style* none. *Stigmas* three, sessile. *Berry* roundish, scarcely crowned, pulpy, one-celled (Gærtn.), three- to five-seeded; funiculi bearing the oblong seeds in the axis of the fruit (D. C.)

SP. CHAR.—*Stem* shrubby, somewhat arboreous. *Leaves* pinnatisect, smooth; segments ovate-lanceolate, serrate. *Corymbs* five-partite (D. C.)

Stem much and irregularly (though always oppositely) branched, of quick growth; *branches* (after a year's growth) clothed with smooth gray bark, and filled with a light spongy pith. *Leaflets* deep green, smooth, usually two pair, with an odd one. *Cymes* [corymbs] large, smooth, of numerous cream-coloured *flowers*, with a sweet but faint smell; some in each cyme sessile. *Berries* globular, purplish-black; their stalks reddish (Smith).

HAB.—Indigenous: in hedges, coppices, and woods, common.

DESCRIPTION.—The *liber* or *inner bark* (*cortex interior sambuci*) is collected from the branches: its colour is greenish-white; its taste sweetish astringent; its odour feeble. Its infusion is rendered slightly green by the sesquichloride of iron. *Elder flowers* (*flores sambuci*) are white when fresh, but by drying become yellow, and retain an agreeable odour. *Elder berries* (*baccæ sambuci*) yield, by expression, a purple juice, called *elder rob*.

COMPOSITION.—I am unacquainted with any analysis of *elder bark*. The *flowers* were analyzed by Eliason (Gmelin, *Handb. d. Chem.* ii. 1279), who obtained from them *volatile oil*, *acrid resin*, *tannin*, *oxidized extractive*, *nitrogenous extractive*, *gum*, *woody fibre*, *glutinous matter*, *albumen*, *malates of potash and lime*, *mineral salts*, and a trace of *sulphur*. *Elder juice* contains *malic acid*, a little *citric acid*, *sugar*, *pectin*, and *colouring matter*, which is reddened by acids, and made green by alkalies.

PHYSIOLOGICAL EFFECTS.—The *flowers*, owing to their volatile oil, are mildly stimulant, and, perhaps, sudorific. The *berries* are cooling, aperient, and diuretic. The *inner bark* (liber) is hydragogue, cathartic, and emetic. The *leaves*, probably, possess similar, though less energetic, properties.

USES.—The *flowers* are seldom employed, except in the preparation of *elder-flower water* and *elder ointment*. The use of the *berries* is now almost solely confined to the manufacture of *elder wine*. The *inspissated juice* of the berries is, however, an officinal preparation. The *inner bark* has been used as a hydragogue cathartic in dropsy. It may be given in decoction (prepared by boiling ℥j. of the bark in Oij. of water to Oj.), in doses of f℥iv. Smaller doses have been used as an aperient and resolvent in various chronic disorders.

1. *OLEUM SAMBUCI*, L. (Directed to be obtained from the flowers by submitting them to distillation with water).—By distillation the flowers yield a small quantity of a butyraceous, odoriferous oil, but totally unfit for any useful purpose. Its introduction into the Pharmacopœia must,

therefore, have been an oversight. The *oil of elder*, sold in the shops, is rape oil coloured with elder, cabbage, or spinach leaves.

2. *Aqua Sambuci*, L. E. (Elder flowers [fresh, *E.*], lb. x. [or Oil of Elder, ʒij. *L.*]; Water, *Cong.* ij.; Proof Spirit, f℥vij. [Rectified Spirit, f℥iij. *E.*] Mix them, and let a gallon distil).—*Elder-flower water* is frequently prepared from the *pickled flowers* (*flores sambuci saliti, i. e.* alternate layers of the flowers and common salt compressed and preserved in a well-closed vessel [usually a cask]: the water which exudes is rejected). It is principally used as a perfume.

3. *Unguentum Sambuci*, L. D. (Elder Flowers, Lard, of each lb. ij.; Boil the Elder flowers in the Lard until they become crisp; then press through a linen cloth.—The *Dublin College* uses the leaves instead of the flowers. Their formula is as follows:—Fresh leaves of Elder, lb. iij.; Prepared Hog's Lard, lb. iv.; Prepared Mutton Suet, lb. ij. Make an ointment in the same manner as the Savine Ointment [see p. 726]).

The *Unguentum Sambuci*, Ph. L. is the *white elder ointment* of the shops. Except in its agreeable odour it has no advantage over spermaceti ointment. The *Unguentum Sambuci*, Ph. D. is the *green elder ointment of the shops:* it is inodorous. It is popularly used as a cooling ointment.

4. *Succus Spissatus Sambuci*, D. (Prepared as the *succus spissatus aconiti*).—Refrigerant, laxative, and diuretic. Diluted with water it forms a cooling beverage in febrile and inflammatory disorders. Dose, ʒj. to ʒij.

Order 51. Aralia'ceæ, *Richard.*—The Aralia Tribe.

Araliæ, *Jussieu.*

Pa'nax quinquefo'lium, Linn. is a native of North America, growing in the Northern, Middle, and Western States of the Union. Its root is the *American Ginseng* (*radix ginseng*). It is exported to China, where it is highly valued. Pieces of it are said to be occasionally found intermixed with *senega root.*

Fig. 194.

Panax quinquefolium.

Pa'nax Schin-seng, Nees v. Esenbeck, is a native of Asia, and has been usually confounded with the preceding species. Nees admits three varieties:—*P. Schin-seng*, var. *coraiensis; P. Schin-seng*, var. *japonica*, and *P. Schin-seng*, var. *nepalensis* (*P. Pseudo ginseng*, Wallich). The root of this species is the *Asiatic Ginseng* (*radix ninsi*).

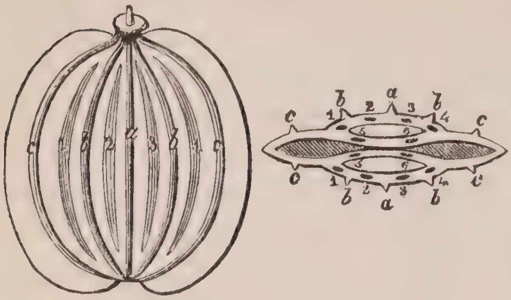
The Chinese physicians ascribe the most improbable and extravagant virtues to ginseng. They regard it as an invigorating and aphrodisiac agent. At Pekin it is said to have been sometimes worth its weight in gold! To the taste it is mucilaginous, sweetish, somewhat bitter, and slightly aromatic. In Europe it is believed to possess very little power.

Order 52. Umbellif'eræ, *Jussieu.*—The Umbelliferous Tribe.

Apiaceæ, *Lindley.*

Essential Character.—Tube of the *calyx* adherent to the ovary; the limb [superior calyx of *Lindley*] entire, or five-toothed, or obsolete. *Petals* five, inserted into the upper part of the calyx [inserted on the outside of a fleshy epigynous disc, *Lindley*], usually inflexed at the point; æstivation imbricate, rarely valvate. *Stamens* five, alternate with the petals, incurved in æstivation. *Ovary* [inferior, *Lindley*], adherent to the calyx, two- (rarely one-) celled, with solitary pendulous ovules; *styles* two, distinct, incrassated at the base into *stylopodia*, covering the whole of the ovarium; *stigmas* simple. *Fruit* (called *diachæna, polyachæna* or *cremocarpium*) consisting of two *mericarps* (i. e. two carpella, with half of the calyx attached, so that they can be called neither *carpella* nor *achenia*), separable from a common axis (*carpophorus*), to which they adhere by their face (*commissure*); the dorsal surface of each carpel is traversed by *ridges*, of which five are primary (*costæ* seu *juga primaria*), and four secondary (*juga secundaria*); the latter are sometimes absent: the spaces between the ridges are called *channels* (*valleculæ*). In the channels, within the pericarp, are, sometimes, linear oily receptacles, called *vittæ*. *Seed* pendulous, usually adhering inseparably to the pericarp, rarely loose: *embryo* minute, pendulous from the apex of the axis (carpophorus); *radicle* pointing to the hilum; *albumen* abundant, horny, flat (*Orthospermæ*), or rolled inwards at the edges (*Campylospermæ*), or rarely curved inwards from the base to the apex (*Cœlospermæ*).—*Herbaceous* plants, with fistular furrowed *stems*. *Leaves* usually divided, sometimes simple, sheathing at the base. *Flowers* in umbels, white, pink, yellow, or blue, generally surrounded by an *involucre* (Condensed from Decandolle).

FIG. 195.



A. B.

Fruit of Pastinaca sativa.

A, Dorsal surface.
B, Horizontal section of the fruit.
a, *b b*, *c c*, juga primaria; 1, 2, 3, 4, 5, 6, vittæ.

PROPERTIES.—Extremely variable.

Ca'rum Ca'rui, Linn. L. E. D.—*Common Caraway.*

Sex. Syst. Pentandria, Digynia.

(Fructus, *L.*—Fruit, *E.*—Semina, *D.*)

HISTORY.—Caraway is not mentioned in the writings attributed to Hippocrates. Pliny (*Hist. Nat.* lib. xix. cap. 49, ed. Valp.) and Dioscorides (lib. iii. cap. 66), however, speak of it: the former calls it *Careum* (from Caria, its native country),—the latter terms it κάρος.

BOTANY. *GEN. CHAR.*—Margin of the *calyx* obsolete. *Petals* regular, obovate, emarginate, with an inflexed lobe. *Stylopodium* depressed. *Styles* deflexed. *Fruit* contracted at the side, ovate, or oblong. *Mericarps* [half-fruits] with five equal filiform ridges, the lateral ones marginal. *Commissure* flat, bivittate. *Channels* one-vittate. *Carpophorus* free, forked at the apex. *Seeds* terete-convex, flat in front.—Smooth often perennial *herbs*. *Root* tuberous, edible. *Leaves* pinnatisect; the segments many cleft. *Involucre* variable. *Flowers* white (D. C.)

SP. CHAR.—*Root* fusiform. *Leaves* bipinnatisect; the lower segments of the branches decussate, all many-cleft. *Involucre* none (D. C.)

Biennial. *Stem* branched about 2 feet high. *Umbels* numerous, dense. *Flowers* white or pale flesh-coloured; appear in June.

HAB.—In meadows and pastures all over Europe; naturalized in England. Largely cultivated in Essex.

DESCRIPTION.—The mericarps commonly called *caraway seeds* (*fructus* seu *semina carui*) are from $1\frac{1}{2}$ to 2 lines long, usually separated, slightly curved inwards, of a brownish colour, with five lighter coloured primary ridges; there are no secondary ones. In each channel is one vitta, and on the commissure are two. The smell is aromatic and peculiar, the

FIG. 196.

(*a*.) *Coriandrum sativum.*
(*b*.) *Carum Carui.*

taste warm and spicy. The caraway of the shops is in part the produce of this country, but is partly supplied from Germany. In 1839, duty (30s. per cwt.) was paid on 515 cwts. which were imported.

Composition.—No analysis of the fruit has been made. The aromatic qualities depend on a volatile oil.

Oleum Carui is pale yellow, but soon becomes brown. It is limpid, has the aromatic odour of the fruit, and an acrid warm taste. Its sp. gr. is 0·959.

Physiological Effects.—Caraway is an aromatic stimulant and condiment (see p. 72). Its effects are similar to dill and anise.

Uses.—Caraway is principally consumed by the confectioner and cook. It is also used by the distiller for flavouring liqueurs. Its medicinal employment is not extensive. It is given to relieve the flatulent colic of children, and enters, as an adjuvant or corrective, into several officinal compounds. It is less seldom employed in substance than in the form of *oil*, *spirit*, or *water*.

1. *Oleum Carui*, L. E. D.—(Obtained by submitting the fruit [bruised, *E.*] to distillation with water). The quantity obtained from a given weight of fruit is variable. Recluz says about 4·7 per cent.; but I am informed, by a manufacturing chemist, that he has obtained 213 lbs. of oil from 35 cwts. of the fruit; which is about 5·43 per cent. The oil is generally employed in the preparation of the *spirit* and *water*. It is used to impart flavour, to correct the nauseating and griping qualities of some medicines, to relieve flatulence. It is frequently added to cathartic pills and powders. Dose, one to ten drops.

2. *Spiritus Carui*, L. E. D.—(Caraway, bruised, ℥xxij. [lb. ss. *E.*, lb. j. *D.*]; Proof Spirit, *Cong.* j. [Ovij. *E. Cong.* j. Wine M. *D.*]; Water Oij. [Oiss, *E.* Sufficient to prevent empyreuma, *D.*] Mix [macerate for two days in a covered vessel, *E.*, for twenty-four hours, *D.*] and distil off a gallon [lb. vij. *E.*], by a gentle heat). This is frequently imitated by dissolving the oil of caraway in spirit. It is aromatic and carminative. Dose, f℥j. to f℥iv. Sweetened with sugar, this spirit is drank in Germany as a drachm (*Kümelliqueur; Kumelbrandtwein*).

3. *Aqua Carui*, L. D.—(Caraway, lb. iss. [lb. j. *D.*]; Water, *Cong.* ij. [enough to prevent empyreuma, *D.*]; [Proof Spirit, f℥vij. *L.*] Distil a gallon). This is usually imitated by dissolving or diffusing the oil through water by the aid of sugar or of carbonate of magnesia. It is employed as a carminative vehicle for purgatives (as saline purgatives, magnesia, &c.) and in the flatulent colic of children.

Pimpinel'la An'isum, Linn. L. E. D.—*The Anise.*

Sex. Syst. Pentandria, Digynia.

(Fructus, *L.*—Fruit, *E.*—Semina, *D.*)

History.—Anise was used by Hippocrates (pp. 263, 265, &c. ed. Fæs.) It is also mentioned by Pliny (*Hist. Nat.* lib. xx. cap. 72, ed. Valp.), and Dioscorides (lib. iii. cap. 65). The latter terms it ἄνισον. It was introduced into this country in 1551. In our translation of the New Testament (*Matth.* xxiii. 23), the word *anise* occurs instead of *dill*.

Botany. *Gen. Char.*—Margin of the *calyx* obsolete. *Petals* obovate, emarginate, with an inflexed lobe. *Fruit* contracted at the side, ovate, crowned by a cushion-like disk and reflexed, somewhat capitate styles. *Mericarps* [half-fruits] with five, filiform, equal ridges, the lateral ones being marginal. *Channels* multivittate, with a bifid free carpophorus. *Seed* gibbous convex, anteriorly flattish.—*Roots* simple, radical *leaves* pinnatisect; the segments roundish, toothed, rarely undivided, those of the stem more finely cut. *Umbels* of many rays. *Involucre* none. *Petals* white, rarely pink or yellow (D. C.)

Sp. Char.—*Stem* smooth. Radical *leaves* cordate, somewhat roundish, lobed, incised, serrate; middle ones pinnate lobed, the lobes cuneate or lanceolate; the upper ones trifid, undivided, linear. *Fruit* bearing a few scattered hairs (D. C.)

Root tapering. *Stem* erect, branched, about a foot high. *Flowers* small white.

Hab.—Island of Scio and Egypt. Largely cultivated for its fruit in Malta, Spain, and various parts of Germany. It also grows in Asia.

Description.—The fruit, called *aniseed* (*fructus* seu *semina anisi*), is slightly compressed at the sides. The separated mericarps are ovate, of a grayish-green colour, with five paler, thin, filiform, primary ridges (there are no secondary ones), and covered with downy hairs. In each channel are three vittæ. The odour is aromatic, and similar to that of the fruit of *Illicium anisatum*, or *star anise*, a plant belonging to the family Winteraceæ. The taste is sweetish and aromatic. By careless observers, aniseed may be confounded with the fruit of hemlock.

Commerce.—Aniseed is principally imported from Alicant and Germany (the first is preferred); but some is also brought from the East Indies. In 1839, duty (5s. per cwt.) was paid on 192 cwts.

Composition.—A very elaborate analysis of the fruit has been made by Brandes and Reimann in 1826 (Gmelin, *Handb. d. Chem.* ii. 1277). The following are their results:—*Volatile oil* 3·00, *stearin combined with chlorophylle* 0·12, *resin* 0·58, *fatty oil* soluble in alcohol 3·38, *phytocol* 7·85, *incrystallizable sugar* 0·65, *gum* 6·50, *extractive* 0·50, *substance analogous to ulmin* (Anis-ulmin) 8·60, *gumoin* 2·90, *lignin* 32·85, *salts* (acetate, malate, phosphate, and sulphate) *of lime and potash* 8·17, *inorganic salts, with silicic acid and oxide of iron* 3·55, *water* 23·00 (excess 1·65).

Oil of Anise (*Oleum Anisi*).—The oil of anise of the shops is imported into this country from Germany and the East Indies. In 1839 duty (1s. 4d. per lb.) was paid on 1544 lbs. It is procured, by distillation, from the fruit, in whose pericarp it resides. When carefully prepared it is transparent and nearly colourless, having a slightly yellow tinge. It has the odour and taste of the fruit from which it is obtained. Its specific gravity increases with its age: thus Martius says, when the oil is fresh distilled, the specific gravity is only 0·979; but after keeping it for a year and a half, the specific gravity increased to 0·9853. It congeals at 50° F., and does not liquefy again under 62°. It is soluble in all proportions in alcohol; but spirit, whose specific gravity is 0·84, dissolves only 0·42 of its weight. By exposure to the air it forms resin, and becomes less disposed to concrete. It is composed of two volatile oils,—one solid at ordinary temperatures (*stearoptène*); the other liquid (*eleoptène*)—in the following proportions:—Eleoptene 75, stearoptene 25. The composition of this oil is $C^{10}\ H^{6}\ O$. Its atomic weight, therefore, is 74.

The *oleum badiani*, or the *oil of star-anise* (*Illicium anisatum*), has the odour and taste of the oil of anise; but it preserves its fluidity at 35·6 F. It is said to be sometimes substituted for the *oleum anisi*.

Spermaceti, which is said to be sometimes added to oil of anise, to promote its solidification, may be distinguished by its insolubility in cold alcohol. Camphor, said to be added for the same purpose, is recognized by its odour.

Physiological Effects.—Anise is an aromatic stimulant (see p. 72). Its effects are similar to those of dill. The odour of anise is said to be recognized in the milk of those who have taken it: moreover, the urine, we are told, acquires an unpleasant smell from it: hence it would appear that the oil of anise becomes absorbed. It has been supposed to promote the secretion of milk, urine, bronchial mucus, and of the menses, though without sufficient evidence. Vogel (*Hist. Mat. Med.* 161) says, that he accidentally discovered pigeons are readily killed by a few drops of the oleum anisi. Hillefield (Wibmer, *Wirk. d. Arznein.* Bd. iv. S. 206) also notices its poisonous operation on pigeons.

USES.—Anise is used to flavour liqueurs, sweetmeats, confectionary of various kinds, ragouts, &c.

In medicine it is employed to relieve flatulence and colicky pains, especially of children, and to prevent the griping effects of some cathartics. Nurses sometimes take it to promote the secretion of milk. It has also been employed in pulmonary affections. It is used as a horse medicine.

1. *OLEUM ANISI*, L. E. D.—(Obtained by submitting the fruit with water to distillation). Mr. Brande says, from 1 cwt. of fruit about two pounds of oil are obtained. The greater part of the oil consumed in this country is foreign. Dose, five to fifteen drops on sugar, or rubbed up with sugar, in camphor mixture.

2. *SPIRITUS ANISI*, L. *Spiritus Anisi compositus*, D. — (Anise, bruised, ℥x. [Anise and Angelica seeds of each lb. ss. *D.*]; Proof Spirit, *Cong.* j. [Wine Measure, *D.*]; Water, Oij. [sufficient to prevent empyreuma, *D.*] Mix [macerate for twenty-four hours, *D.*] and let a gallon distil). Stimulant, stomachic, and carminative. Dr. Montgomery (*Observ. on the Dubl. Pharm.*) says the preparation of the Dublin Pharmacopœia is nearly the composition of the Irish *Usquebaugh*, which is coloured yellow by saffron, or green by sap-green. A spirit of anise, sweetened with sugar, is sold by the liqueur dealers. A somewhat similar compound is prepared in France, under the name of *crême d'anise*. The pharmacopœial preparation is usually imitated by dissolving the oil in spirit. Dose, fʒj. to f℥iv.

3. *AQUA ANISI*.—(Extemporaneously made by diffusing the oil through water by the aid of sugar or spirit). Employed to relieve flatulent colic of infants, and as a vehicle for other medicines.

Fœnic'ulum vulga're, Gærtner, L.—*Common Fennel.*

Fœniculum officinale, *E.*—Anethum Fœniculum, *D.*

Sex. Syst. Pentandria, Monogynia.

HISTORY.—Fennel (μάραθρον) was used by Hippocrates (p. 551, &c. ed. Fæs.) Some botanists (e. g. Matthiolus) have been of opinion that μάραθρον of Dioscorides (lib. iii. cap. 81) is *sweet fennel* (*Fœniculum dulce*, Dec.), and that the ἱππομάραθρον of the same authority (*Ibid.* cap. 82) is *common fennel* (*Fœniculum vulgare*, Dec.); but the latter part of the opinion does not, from an observation of Bauhin (*Prodromus*, p. 76), appear probable (Dierbach, *Arzneim. d. Hippocr.* 191).

BOTANY. *GEN. CHAR.*—Margin of the *calyx* swollen, obsolete, toothless. *Petals* roundish, entire, involute, with a squarish, blunt lobe. *Fruit* by a transverse section nearly taper. *Mericarps* [half fruits] with five, prominent, bluntly-keeled ridges, of which the lateral ones are marginal and rather broader. *Channels* univittate. *Commissure* bivittate. *Seed* nearly semi-terete.—Biennial or perennial *herbs*. *Stems* taper, somewhat striated, branched. *Leaves* pinnatisect, decompound; the segments linear, setaceous. *Involucre* scarcely any. *Flowers* yellow (D. C.)

Sp. Char.—*Stem* somewhat terete at the base. Lobes of the *leaves* linear, subulate, elongated. *Umbels* of 13 to 20 rays. *Involucre* none (D. C.)

A biennial, three or four feet high. *Flowers* golden yellow. *Fruit* scarcely two lines long, oval, of a dark or blackish aspect; the channel is brownish owing to the vitta, the ridges are pale yellowish gray.

Hab.—Sandy and chalky ground all over Europe.

Description.—The fruit, called *wild fennel seed* (*semina* seu *fructus fœniculi vulgaris*) has a strong aromatic, acrid taste, and an aromatic odour. Its other qualities have been described.

Composition.—The peculiar properties of the fruit depend on *a volatile oil.*

Oil of Common or *Wild Fennel* (*Oleum Fœniculi vulgaris*).—A pale yellow, limpid oil, having the peculiar odour of the fruit. Its sp. gr. is 0·997. It congeals by cold, though with much more difficulty than oil of anise. Its composition is $C^{6\frac{1}{2}}\ H^4\ O$. Its stearoptène has the same composition as oil of anise (i. e. $C^{10}\ H^6\ O$).

Physiological Effects.—Aromatic stimulant (see p. 72), similar to sweet fennel.

Uses.—This species is not employed in medicine.

Fœnic'ulum dul'ce, C. Bauhin; D. C.—*Sweet Fennel.*

Sex. Syst. Pentandria, Monogynia.

(Fructus).

History.—This plant is regarded by some botanists as a cultivated variety of the former plant. Decandolle (*Prodr.* iv. 142) is the principal systematic writer who regards them as distinct species. The London College, in quoting his *F. vulgare* as the officinal plant, has committed an obvious error, seeing that it is his *F. dulce* which is always employed in medicine in this country.

Botany. *Gen. Char.*—See F. vulgare.

Sp. Char.—*Stem* somewhat compressed at the base. Radical *leaves* somewhat distichous; lobes capillary, elongated. *Umbels* of six to eight rays (D. C.)

This plant differs from *F. vulgare* in several other particulars. It is an annual, and much smaller plant. It flowers earlier. Its turiones are sweeter, less aromatic, and, therefore, edible. The fruit is much longer; some of the specimens being nearly five lines in length, less compressed, somewhat curved and paler, with a greenish tinge.

Hab.—Italy, Portugal, &c. Cultivated as a pot-herb, and for garnishing.

Description.—The fruit, termed *sweet fennel seeds* (*fructus* seu *semina fœniculi dulcis* vel *fœniculi cretici*), has a more agreeable odour and flavour than common or wild fennel. Two kinds are known in trade, *shorts* and *longs:* the latter are most esteemed.

Composition.—The peculiar properties of the fruit depend on a volatile oil.

Oil of Sweet Fennel (*Oleum Fœniculi dulcis*) is distinguished from the oil of wild or common fennel principally by its more agreeable odour and taste. My samples are paler coloured than the oil of wild fennel.

Physiological Effects.—Sweet fennel is an aromatic stimulant (see p. 72): its effects are similar to those of anise or dill.

Uses.—Seldom employed. May be given in the flatulent colic of children, or as a carminative vehicle for remedies which are apt to gripe.

1. *Oleum Fœniculi*, E. D. — (Obtained by submitting the fruit [bruised, *E.*] with water to distillation). Nineteen *cwts.* of the fruit (*shorts*) have yielded 78 lbs. of oil (*Private information*). Stimulant and carminative. Seldom used. Dose, two to twenty drops.

2. *Aqua Fœniculi*, E. D.—(Obtained as *Aqua Anethi*). Carminative. Employed to relieve flatulent colic of infants, and as a vehicle for other medicines. Dose, for an adult, f℥j. to f℥iij.; for an infant, fʒj. to fʒij.

Archangel'ica officina'lis, Hoffm. and Koch.—*Garden Angelica.*

Angel'ica Archangel'ica, Linn. E. D.

Sex. Syst. Pentandria, Digynia.

(Root, *E.*—Semina, *D.*)

History.—It is doubtful whether the ancient Greeks and Romans were acquainted with this plant, as no certain notice of it appears in their writings. C. Bauhin (*Pinax*, 155) calls it *Angelica sativa*.

Botany. *Gen. Char.*—Margin of the *calyx* with five short teeth. *Petals* elliptical, entire, acuminate, with the point curved inwards. *Fruit* somewhat compressed at the back, with a somewhat central raphé, two-winged on each side. *Mericarps* [half-fruits] with thick, keeled ridges; the three dorsal ones elevated, the two lateral ones dilated into a twice as broad wing. *Seed* not adhering to the integument; the nucleus free, covered all over with numerous vittæ. *Carpophorus* two-partite.—Perennial *herbs*. *Leaves* pinnatisect; segments broadly ovate, acute, coarsely dentate, terminal, lobed. *Petioles* large, sheathing, saccate. *Involucre* scarcely any; *partial one* halved, many-leaved. *Flowers* white, or greenish (D. C.)

Sp. Char.—*Stem* smooth, terete, striated. *Leaves* bipinnatisect; segments subcordate, lobed, sharply serrated, the odd one three-lobed; sheaths loose, saccate. Leaflets of the *partial involucre* equalling the partial umbel (D. C.)

Root biennial, large, fleshy, branched, resinous, pungently aromatic. *Stem* four or five feet high, a little glaucous. *Foliage*, *stalks*, and even the *flowers*, bright green. It flowers from June to September.

Hab.—Indigenous; northern parts of Europe. Cultivated in moist situations, and on the banks of ditches.

Description.—The dried angelica root (*radix angelicæ*) of the shops is imported from Hamburg in casks. In 1839 duty (4s. per cwt.) was paid on 386 cwts. Formerly *Spanish Angelica* was alone employed for medicinal purposes. The dried root of the shops consists of a short cylindrical head, from which numerous branches arise. The size of these branches varies: the larger ones are as thick as the little finger, and six or eight inches long. Externally the root is corrugated, and grayish brown. Internally it is dirty white, and presents, when cut transversely, numerous dark points, which are the cut extremities of vessels or intercellular spaces filled with a liquid, strongly odorous oil or oleo-resin. To the taste the root is at first sweet, then hot, aromatic, and bitter. The odour is peculiar, and not very disagreeable. The fruit, called *angelica seeds* (*fructus* seu *semina angelicæ*) have the odour and taste, but in a diminished degree, of the root.

Composition.—Angelica root has been analyzed by John (Gmelin, *Handb. d. Chem.* ii. 1277), and by Bucholz and Brandes. The latter chemists obtained *volatile oil* about 0·70, *acrid soft resin* 6·02, *bitter extractive* 26·40, *gum* with some common salt 31·75, *starch* (not inulin) 5·40, *woody fibre* 8·60, *peculiar matter* (oxidized extractive?) 0·66, *albumen* 0·97, *water* 17·50, [loss 2·0]. The aromatic qualities of the root and seeds depend on the volatile oil and resin.

Physiological Effects.—Both root and seeds are pungent aromatic stimulants and mild tonics.

Uses.—Angelica (either root or seeds) is scarcely employed in modern practice, though it was formerly much esteemed. The tender stems, stalks, and midribs of the leaves, are made, with sugar, into a sweetmeat or candy (*candied angelica; caules* seu *rami angelicæ conditi*), which, taken as a desert, is a very agreeable stomachic. The *seeds* are used in the preparation of the *spiritus anisi compositus*, D. The principal consumption of angelica root and seeds is by rectifiers and compounders in the preparation of gin and the liqueur termed *bitters*.

Opop'onax Chiro'nium, Koch. L.—*The Opoponax.*

Pastina'ca, Opop'onax, *Linn. D.*

Sex. Syst. Pentandria, Monogynia.

(Gummi-resina, *L. D.*)

History.—Hippocrates (*Opera*, p. 402, ed. Fæs.) employed opoponax (πανάκες). Theophrastus (*Hist. Plant.* lib. ix. c. 12) mentions four, and Dioscorides (lib. iii. cap. 55-6-7), three kinds of πανάκες. The latter of these writers has given a good account of opoponax (ὀποπάναξ), which he says is procured from πανάκες ἡράκλειον.

Botany. *Gen. Char.*—Margin of the *calyx* obsolete. *Petals* roundish, entire, rolled inward, with a rather acute lobe. *Stylopodium* broad, thick. *Styles* very short. *Fruit* flattened at the back, with a dilated convex margin. *Mericarps* [half-fruits] with three dorsal, filiform, very thin ridges, and no distinct lateral ones. *Vittæ* three to each channel, six to ten to each commissure. *Seed* smooth.—Perennial *herb*. *Root* thick. *Stem* rough. *Leaves* bipinnatisect; segments unequally cordate, crenate, obtuse. *Umbels* compound, of many rays. General and partial *involucre* few-leaved. *Flowers* yellow (D. C.)

Sp. Char.—The only species.—A plant six or seven feet high, resembling the parsnip.

Hab.—Sunny parts of the South of France, Italy, Sicily, Croatia, and Greece.

Extraction.—According to Dioscorides, whose account is probably correct, this gum-resin is obtained by incisions into the root: a milky juice exudes which, by drying, becomes yellow, and forms opoponax.

Description.—Opoponax (*gummi opoponax*) occurs in irregular yellowish-red pieces (*op. in massis*), or in reddish tears (*op. in lachrymis*). It has an acrid bitter taste, and an unpleasant odour. Rubbed with water it forms an emulsion. Its general properties as a gum-resin have been before (p. 75) noticed.

Composition.—Opoponax has been analyzed by Pelletier (*Bull. de Pharm.* iv. 49). He found the constituents to be—

Resin	42·0
Gum	33·4
Starch	4·2
Extractive	1·6
Wax	0·3
Malic acid	2.8
Lignin	9·8
Volatile oil, trace of caoutchouc, and loss	5·9
Opoponax	100·0

Resin.—Reddish yellow; fusible at 122° F. Soluble in alkalies, alcohol, and ether. The alkaline solution is reddish: the resin is precipitated from it, by hydrochloric acid, in the form of yellow flocks. Nitric acid acts feebly on the resin.

Physiological Effects.—Similar to the other fetid, antispasmodic gum-resins (see p. 75). It is, perhaps, more allied to ammoniacum than to any other of these substances.

Uses.—Opoponax is rarely employed. It is adapted to the same cases as the other gum-resins of this class (see p. 75).

Fer'ula Asafœ'tida, Linn., L. E. D.—*The Asafœtida Ferula.*

Sex. Syst. Pentandria, Digynia.

(Gummi-resina, *L. D.*—Gummy-resinous exudation, *E.*)

History.—It is uncertain at what period asafœtida was first known or described. The difficulty in determining its history arises from the confusion which has existed with respect to the *Succus Cyrenaicus* and asafœtida. By many writers the two substances were considered to be identical (see Geoffroy, *Tract. de Mat. Med.* ii. 609); but this opinion seems now to have been satisfactorily disproved by the discovery of the plant, called by the Greeks σίλφιον, by the Romans *laserpitium* (*Thapsia Silphion*, Viviani), which yields the Cyrenaic juice, and which agrees tolerably well with the rude figures struck on the Cyrenean coins (*Penny Cyclopædia*, vol. viii. p. 265; and Lindley, *Fl. Med.* 52). It would appear, however, that the Cyrenaic juice becoming scarce, the ancients employed some other substance of similar, though inferior, properties, as a substitute, and to both of these they applied the term *laser*. "For many years," says Pliny (*Hist. Nat.* lib. xix. cap. 15, ed. Valp.) "this plant [laserpitium or silphion] has not been found in Cyrenaica, because the publicans [or farmers] who rent the pastures, finding it more profitable, destroy it as food for cattle. One stalk only, found in our days, was sent to the emperor Nero. We may know when cattle meet with young shoots of it, by the sleeping of the sheep when they have eaten it, and the sneezing of the goats. For a long time past the only *laser* brought to us is that which is produced abundantly in Persia, Media, and Armenia; but it is far inferior to the Cyrenaic."

Now it is not at all improbable that the *laser of Persia* may have been our asafœtida. The word "asafœtida" says Murray (*App. Med.* i. 361) "seems to have been introduced by the Monks into the school of Salernum." But it appears to have been of oriental origin, and may be, as some have suspected, derived from the word *laser*. Nicolaus Myrepsicus (*Antidotarius*, cap. xxvii. p. 365, quoted by Alston, *Mat.*

Med. ii. 438), almost the last of the Greek physicians, and who lived, according to Sprengel (*Hist. de Méd.* iv. 368) about 1227, A. D. speaks of ἀσα φιτιδα. "There are two kinds of *Assa* [i. e. *laser*, Lat. Trans.]" says Avicenna (lib. 2ndus, tr. 2ndus, cap. 53), "one *fetid*, the other *odoriferous*."

BOTANY. *GEN. CHAR.*—Margin of the *calyx* shortly five-toothed. *Petals* ovate, entire, acuminate, with an ascending or incurved point. *Fruit* flattened at the back, with a dilated flat border. *Mericarps* [half-fruits] with three, dorsal, filiform ridges, the two lateral obsolete and lost in the dilated margin. *Vittæ* in the dorsal channels three or more; in the commissure four or many. *Seed* flat. *Carpophorus* bipartite.—*Herbs. Root* thick. *Stem* tall. *Leaves* supra-decompound; the segments usually divided into linear lobes. *Umbels* of many rays, lateral, often opposite or verticillate. *Involucre* various. *Flowers* yellow (D. C.)

SP. CHAR.—*Stem* terete, simple, cloathed with leafless sheaths. *Leaves* radical, pinnatisect; the segments one- or two-pinnatified-sinuate; lobes oblong, obtuse. *Involucre* none (D. C.)

Root perennial, tapering, ponderous, increasing to the size of a man's arm or leg, covered with a blackish-coloured bark, beset near the top with many strong, rigid fibres; its internal substance white, fleshy, abounding with a thick, milky juice, which has an excessively strong, fetid, alliaceous smell. *Stem* two or three yards high or more, six or seven inches in circumference at the base, smooth. Radical *leaves* near two feet long. Kæmpfer (*Amœn. exot.* 535) compares their shape to that of the leaves of Pæonia officinalis; but in colour, and other respects, he says they resemble Ligusticum Levisticum, or Lovage. The *fruit* is flat, thin, reddish-brown, like that of parsnip, only rather larger and darker (Kæmpfer).

HAB.—Persia; mountains of Chorasan and Laar. The asafœtida plant, stated by Lieut. Burnes (*Travels into Bokhara*, ii. 243) to grow at an elevation of 7,000 feet, on the Hindoo Koosh, is described as being an annual. If the description be correct, the plant can scarcely be F. Asafœtida.

There is reason to suspect that *Ferula Asafœtida* is not the only plant from which a gum-resin, called asafœtida, is obtained; but that one, if not more, other species also yield it (Lindley, *Fl. Med.* p. 45-6, and *Bot. Reg.* Aug. 1839). *Ferula persica* has been described by Dr. Hope (*Phil. Trans.* vol. lxxv.) as the true asafœtida plant; and the *Edinburgh College* has admitted it as being, probably, one source of asafœtida. Michaux sent its fruit from Persia as asafœtida (Lindley, *Fl. Med.* 46). That it does really yield asafœtida seems furthermore probable, from the strong smell of that drug, which pervades the whole plant (Stephenson and Churchill, *Med. Bot.* iv. 169; and Nees and Ebermaier, *Handb.* ii. 55). It is, I think, not unlikely that the tear and lump asafœtida of the shops are procured from different species. Dr. Royle (*Illustr.* 230) suggests, that *Prangos pabularia* was one of the kinds of *Silphium* of the ancients, and may be an asafœtida plant.

EXTRACTION.—Asafœtida is obtained by making incisions into the upper part of the root; the footstalks of the leaves and the fibres at the top of the root being previously removed. Kæmpfer divides the business of collecting into four parts: the *first* begins about the middle of April, and consists in digging the earth about the root, removing the leaves and fibres, which are afterwards laid over the root to defend it from the sun. The *second* commences on the 25th of May. Each collector is provided with a sharp knife to cut the root, a broad iron spatula to scrape off the juice, a cup fixed to his thigh to receive it, and two baskets hung over his shoulders upon a pole. The top of the root is then cut off transversely, and, on the third day (*i. e.* the 27th of May), the juice is scraped off and put in the cups. A fresh incision is then made, and the juice removed the day but one following (*i. e.* the 29th of May), when they again cut the roots. The cups are from time to time emptied into large vessels. The juice is exposed to the sun to become harder, and is conveyed home in the baskets. The *third* and the *fourth* acts are mere repetitions of the second. The third commences about the 10th of June, the fourth about the 3rd of July. Except after the last operation, the roots are carefully defended from the sun, after each incision, by covering them with the leaves (Kæmpfer, *op. cit.*)

Commerce.—Asafœtida is exported from the Persian gulf to Bombay, from whence it is sent to Europe. It comes over usually in casks and cases. In 1825 the quantity imported was 106,770 lbs.; in 1830 only 8,722 lbs. The quantity retained for home consumption is, however, very small. In 1838, duty (6s. per cwt.) was paid on 60 cwts; in 1839, on 24 cwts.

Description and Varieties.—Asafœtida (*Asafœtida; Gummi Asafœtida*, offic.) occurs in irregular pieces of variable size. Externally they are yellowish- or pinkish-brown. The fracture is a conchoidal whitish, or milk-white, translucent, pearly, with a waxy lustre. By exposure to light and air the recently-fractured surface acquires, in a few hours, a violet-red or peach-blossom red colour, which, after some days or weeks, diminishes in intensity, and gradually passes into yellowish or pinkish-brown Asafœtida is fusible and inflammable, burning in the air with a white flame and the evolution of much smoke. Its taste is acrid and bitter, and its odour strong, alliaceous, and peculiar; to most persons being remarkably disagreeable, whence the Germans have denominated asafœtida *Teufelsdreck*, or *Stercus Diaboli;* in plain English, *Devil's dung.* However, this dislike to the asafœtida is not universal; some of the Asiatics being exceedingly fond of it, taking it with their food as a condiment, or using it to flavour their sauces, or even eating it alone. Hence, among some of the older writers, we find it denominated *Cibus Deorum,—Food of the Gods.* Captain M. Kinnier (Ainslie, *Mat. Ind.* i. 21) tells us, that in Persia the leaves of the plant are eaten like common greens, as is the root when roasted: and Lieut. Burnes (*Travels,* ii. 243), speaking of asafœtida, says, " in the fresh state it has the same abominable smell; yet our fellow-travellers greedily devoured it." But the fondness for this substance is not confined to the Asiatics; for I am assured, by an experienced gastronome, that the finest relish which a beef steak can possess, may be communicated by rubbing the gridiron on which the steak is to be cooked with asafœtida.

I am acquainted with two varieties only of asafœtida, but Martius describes three:—

(*a.*) *Asafœtida in the tear* (*Asafœtida in granis* seu *lachrymis*). ? *Asafœtida of the Ferula persica* —This kind occurs in distinct, roundish, flattened or oval tears, and also in irregular pieces, varying from the size of a pea to that of a walnut, of a yellow or brownish-yellow colour externally, but white internally. This kind is comparatively rare. I think it not at all improbable that this variety is obtained from a different plant to that which furnishes the lump variety; for its colour, externally, is more yellow, its odour is much feebler, and its fresh-fractured surface becomes more slowly and less intensely red by exposure to the air. As it has considerable resemblance to *ammoniacum in the tear* (with which, indeed, except by its odour, it might be readily confounded), may it not be the substance which Olivier (Fée, *Hist. Nat. Pharm.* ii. 199) calls ammoniacum, and which he says is produced by *Ferula persica?*

(*b.*) *Lump Asafœtida* (*Asafœtida in massis*). *Asafœtida of the Ferula Asafœtida.*—This variety is that usually met with in the shops. It occurs in variable sized masses, of irregular forms, and having a reddish or brownish-yellow colour. Frequently these masses are observed to be made up of tears, agglutinated by a reddish-brown substance: these form that kind of asafœtida sometimes denominated *amygdaloid* (*asafœtida amygdaloides.*)

Martius describes a third kind of asafœtida, under the name of *Stony Asafœtida* (*Asafœtida petræa*). He says it occurs in irregular more or less angular pieces, and externally resembles dolomite. It is the kind analysed by Angelini, who found in it 51·9 per cent. of gypsum.

Composition.—Asafœtida has been analyzed by Pelletier (*Bull. de Pharm.* iii. 556), Trommsdorf, Brandes, and Angelini (Gmelin, *Handb. d. Chem.* ii. 624):—

Pelletier's Analysis.

Resin	65·00
Gum	19·44
Bassorin	11.66
Volatile oil	3·60
Supermalate of lime, and loss	0·30
Asafœtida	100·00

Brandes's Analysis.

Resin	48·85
Gum, with traces of saline matters	19·40
Bassorin	6·40
Volatile oil	4·60
Extractive, with saline matters	1·40
Sulphate and carbonate of lime	9·70
Oxide of iron and alumina	0·40
Sand and lignin	4 60
Water	6·00
Asafœtida	101·35

1. *Volatile Oil of Asafœtida.*—This is obtained by distilling asafœtida with either water or alcohol. It is on this principle that the odour of this gum-resin depends. It is lighter than water, and is at first colourless, but by exposure to the air acquires a yellow tinge. It dissolves in all proportions in alcohol and ether, but requires more than 2000 times its weight of water to dissolve it. Its taste is at first mild, then bitter and acrid; its odour is very strong. It evaporates very quickly, and soon fills a large room with its odour. Sulphur, and probably phosphorus, are among its elementary constituents. The presence of sulphur in asafœtida is shown in various ways: thus if chloride of barium be added to water distilled from asafœtida, and likewise a little chlorine, the sulphur becomes gradually acidified, and after some time a precipitate of sulphate of baryta is formed. Moreover, if pills made of asafœtida be rolled in silver leaf, the latter, after a few days, is blackened by the formation of a sulphuret of silver.

2. *Resins of Asafœtida.*—The resinous matters of asafœtida are soluble in alcohol. When the alcoholic solution is mixed with water, a milky fluid is formed, owing to the deposition of the *hydrated resin.* Oil of turpentine and the oil of almonds also dissolve the resins, but less readily than alcohol. Brandes has shown that the resin of asafœtida is of two kinds; one insoluble in ether, the other soluble. The proportion of the first to the second is as 1·6 to 47·25.

a. Resin insoluble in ether.—Is brownish-yellow, brittle, tasteless, has a slight alliaceous odour, is fusible, and soluble in warm caustic potash.

β. Resin soluble in ether.—Is greenish-brown, brittle, has an aromatic odour, and a faint, but permanent, alliaceous bitter taste. Chlorine decolorizes it. Cold oil of vitriol renders it dark red: if heat be applied, sulphurous acid is evolved, and the mixture becomes black: if the liquid be diluted with water and saturated with an alkali, the surface assumes a sky-blue colour. Nitric acid renders it first orange, then yellow, and makes it almost insoluble in ether. Hydrochloric acid dissolves it, and colours it pale-red. It dissolves in boiling concentrated acetic acid, but is deposited when the solution cools.

Characteristics.—Asafœtida possesses the usual characteristics of a gum-resin (p. 75). From other gum-resins it is distinguished by its peculiar odour, which is especially obvious when a small portion of this substance is heated on the point of a knife, and by its fresh-fractured surface becoming red on exposure to air. Heated with sulphuric acid it blackens, yields a dark, blood-red liquid, and develops sulphurous acid gas: if the liquid be diluted with water, and saturated with caustic potash, it becomes blue, especially on the surface, by reflected light, similar to that observed when disulphate of quinia is dissolved in water.

Physiological Effects.—Asafœtida is usually placed, by pharmacological writers, among those remedies which they denominate antispasmodics or stimulants. It is the most powerful of the fœtid gum-resins already noticed (p. 75). Its local effects are moderate: it is devoid of those acrid and irritating properties possessed by gamboge, euphorbium, scammony, and many other resinous and gummy-resinous substances. In the mouth, as already mentioned, it causes a sensation of heat, and the same effect, accompanied by eructations, is experienced in the stomach, when asafœtida is swallowed. In Professor Jörg (Wibmer, *Wirk. d. Arzneim. ü. Gifte.* Bd. ii. 366) and his pupils (males and females), who endeavoured to elucidate the effects of this medicine by experiments made on themselves, doses of asafœtida, not exceeding a scruple, caused uneasiness and pain of the stomach, increased secretion of the gastro-intestinal membrane, and alvine evacuations. The pulse was increased in frequency, the animal heat augmented, the respiration quickened, and the excretions from the bronchial membrane and skin promoted. A very constant effect was headache and giddiness. The urino-genital apparatus appeared to be specifically affected, for we are told, in the males there was an increase of the venereal feelings, with irritation about the glans penis, while in the females the catamenial discharge appeared before its usual period, and uterine pain was experienced.

These stimulant effects of asafœtida were observed in a greater or less degree in all the nine persons experimented on; and it should be borne in mind, that the dose did not, in any one case, exceed a scruple. Very opposite to these results, and to the observations of practitioners generally, is the statement of MM. Trousseau and Pidoux (*Traité de Thérap.* p. 12-13), who tell us that they have taken half an ounce of good asafœtida at one dose, with no other effect than that of altering the odour of their secretions, by which they were kept for two days in an infected atmosphere, possessing a more horrible degree of fetidity than even asafœtida itself! These apparently contradictory results seem to prove, that different individuals are most unequally susceptible of the influence of this remedy.

The influence of asafœtida in convulsive and spasmodic diseases seems indisputable. As in these cases the functions of the excito-motory system are the functions principally or essentially involved, it is not assuming too much to suppose, that the influence of asafœtida is principally directed to the excito-motory nerves. To paraphrase the words of Dr. M. Hall (*Lectures* in the *Lancet*, April 14, 1838), asafœtida acts through the *excitor* nerves; its effects are manifested through the *motor* nerves. The varying degrees of excitability or susceptibility (natural and morbid) of these nerves in different subjects, will, perhaps, in some measure account for the unequal effects produced by this agent on different healthy individuals, as well as for the therapeutical influence in certain subjects being disproportionate to the observed physiological effects.

Asafœtida, or its odorous principle, becomes absorbed by the veins, though slowly. Flandrin (Magendie, *Physiol.*, by Milligen, 285, 1823) gave half a pound of this gum-resin to a horse; the animal was fed as usual, and killed sixteen hours afterwards. The odour of asafœtida was distinguished in the veins of the stomach, of the small intestine, and the cæcum: it was not noticed in the arterial blood, nor in the lymph. Tiedemann and Gmelin (*Versuch.* S. 9) were not successful in their search for it: they gave two drachms of asafœtida to a dog, and at the end of three hours were unable to recognize the odour of it either in the chyle of the thoracic duct, or in the blood of the splenic and portal veins; but they detected it in the stomach and small intestines. In farther proof of the opinion that asafœtida becomes absorbed, may be mentioned the detection of the odour of this substance in the secretions. The experience of MM. Trousseau and Pidoux, already related, may be adduced as corroborative of this statement. We are told that the transpiration of Asiatics who use asafœtida daily, is extremely fetid; a circumstance to which Aristophanes (*Equites*, Act. ii. Scen. 4) alludes. Vogt (*Pharmakodyn.* ii. 126, 2te Aufl.) says, that the secretions from carious ulcers sometimes smell of asafœtida, when this substance has been taken for some time.

The stimulant influence of asafœtida over the organs of circulation and of secretion (as the bronchial membrane and skin), depends apparently on the topical action of the oily and resinous particles on the vessels in their passage through the latter.

Uses.—From the foregoing remarks it will be readily gathered, that asafœtida is contra-indicated in febrile and inflammatory diseases, on account of its stimulant properties; as also in vascular irritation, or inflammation of the stomach, on account of its topical influence on this viscus. On the other hand, it is found highly useful in spasmodic or convulsive diseases not dependent on disease of the nervous centres, but of the kind called by Dr. Hall eccentric.

1. *In spasmodic and convulsive Diseases.*—Few remedies have acquired such celebrity in *hysteria*, as asafœtida. Dr. Cullen (*Mat. Med.* ii. 367) speaks in the highest terms of it, and I believe the experience of most practitioners corroborates his opinion of its virtues. "I have found it," says he, "to be the most powerful in all hysteric cases; and when the presence of an hysteric paroxysm prevented medicines being taken by the mouth, I have found it given in clyster to be very effectual." When the circulation is very languid, ammonia may with advantage be conjoined. Schönheyder (*Acta Reg. Soc. Hafn.* i. 168) recommends asafœtida with opium, in the form of clyster. In *infantine convulsions*, clysters of asafœtida are often used with good effect. Even in the *epilepsy* of adults they are not always without value. In purely *spasmodic asthma*, I have never seen relief from the use of asafœtida. This observation, which accords with Dr. Cullen's experience, does not agree with the statements of others. Trousseau and Pidoux (*op. cit.* p. 15) declare they have seen it produce good and undoubted effects. But in old chronic catarrhs, with occasional spasmodic difficulty of breathing and spasmodic cough, I have procured the most marked relief by the combined use of asafœtida and ammonia. I have no experience of the use of this gum-resin in the disease called *laryngismus stridulus*, in which Millar (*Obs. on*

the Asthma and *Hooping Cough*, 1769), and others have found it beneficial. In *hooping cough*, both Millar and Kopp (*Lond. Med. Gaz.* i. 581) have found it beneficial. It promotes expectoration, and diminishes both the violence and frequency of the attacks. The repugnance which children manifest to its use is, however, a great drawback to its employment. In *flatulent colic* of hysterical and dyspeptic individuals, or of infants, few remedies are more efficacious, when the disease is unaccompanied by any marks of inflammatory action, and is attended with constipation. Of its efficacy in the flatulent colic of infants, I can speak from repeated observation; it is given with great advantage in the form of clyster. In most cases, its laxative operation is an advantage; but should this be an objection, it may be counteracted by the addition of laudanum.

2. *As a stimulating expectorant and antispasmodic in chronic catarrh*, it is often of considerable use. It is adapted for old persons, and where the disease is of long standing. I have found it most beneficial in those cases where the cough and difficulty of breathing assume at intervals a spasmodic form, and where the wheezing is considerable. In such, I have found full doses of asafœtida with ammonia give great relief. In delicate females, subject to repeated attacks of catarrh, attended with wasting, sweating, and other constitutional symptoms of phthisis, I have found asafœtida of frequent benefit. In these cases, it does not act merely by its expectorant effects, for oftentimes one good consequence of its use is diminution of excessive bronchial secretion.

3. *In affections of the alimentary canal.*—The use of asafœtida *in flatulent colic* has been above noticed. It is often of considerable value in relieving flatulence in old persons, especially in hypochondriacal and hysterical subjects, and when accompanied with constipation, as it has a laxative effect. It provokes the expulsion of the gaseous matter, and appears to aid in preventing its re-production. It is beneficially used in the form of clyster, to relieve a tympanitic condition of the abdomen and flatulent distension of the bowels in low fevers. In *constipation, with flatulence*, it is an useful addition to purgative mixtures or enemata. It has often been used as an *anthelmintic*; but it is of less frequent efficacy.

4. *As an emmenagogue in uterine obstructions* (amenorrhœa and chlorosis) asafœtida has been employed from a notion that it specifically affected the womb,—an opinion which is supported by the reports of Jörg's female pupils, that it brought on the catamenial discharge earlier than usual. Experience, however, has not been much in favour of the emmenagogue operation of asafœtida when this remedy has been employed in diseases. "Whether it be owing," says Dr. Cullen, "to the imperfect state in which we too frequently have this medicine, or to somewhat in the nature of the amenorrhœa, I would not positively determine; but this is certain, that I have very seldom succeeded in employing the asafœtida as an emmenagogue."

5. *As a condiment.*—I have already referred to the condimentary uses made of asafœtida, especially by oriental nations. At the Pass of "Dundan Shikun," says Lieut. Burnes (*Travels*, i. 143), "we found the asafœtida plant in exuberance, and which our fellow-travellers ate with great relish." It is much used by the Brahmins against flatulence, and to correct their cold vegetable food (Ainslie, *Mat. Indica*, i. 21.)

Administration.—The dose of asafœtida is from grains v. to ℈i.

or ʒss. It may be given in substance, in the form of *pill*, or made into an *emulsion*, (See *Mistura Asafœtidæ*). In hysteria and flatulent colic, where we want an immediate effect, it is best administered in a liquid form. Used as an *enema*, it may be administered to the extent of two drachms, rubbed up with warm water. (For another formula, see *Enema fœtidum*). The following are the officinal preparations of asafœtida.

1. *Mistura Assafœtidæ*, L. D. *Lac Assafœtidæ* (Assafœtida, ʒv. [ʒj. *D.*]; water Oj. [Pennyroyal water, f℥viij. *D.*] Triturate the assafœtida with the water, gradually poured on, until they are perfectly mixed).—Stimulant and antispasmodic. Used in hysteria, in doses of ℥ss. to f℥jss. Frequently employed as an enema in the flatulent colic and convulsions of children, as well as in worms. The tincture of asafœtida, mixed with pennyroyal water, is often used as a substitute for the officinal mixture.

2. *Enema fœtidum*, D. E. (Made by adding to the *cathartic enema*, two [fluid-] drachms of tincture of asafœtida.)—The *cathartic enema*, (*Enema Catharticum*, D. E.) here alluded to, is thus made: "Olive Oil, ℥j.; Sulphate of Magnesia, ℥ss.; Sugar, ℥j.; Senna, ʒss.; Boiling Water, f℥xvj. Infuse the senna for an hour in the water; then dissolve the salt and sugar; add the oil, and mix them by agitation." *E.* The *Dublin College* dissolves one ounce of Manna in f℥x. of Compound Decoction of Chamomile, and adds Olive Oil, ℥j.; Sulphate of Magnesia, ℥ss. The fœtid clyster is a valuable stimulant, antispasmodic, and carminative purgative, which may be used with most beneficial results in hysteria, flatulent colic, infantile convulsions, and even worms in the rectum.

3. *Tinctura Assafœtidæ*, L. E. D. (Assafœtida [in small fragments, *E.*] ℥v. [℥iv. *E. D.*]; Rectified Spirit, Oij. [and water, Oss. *D.*] Macerate for fourteen [seven, *E.*] days, and strain. "This tincture cannot be made by percolation, without much delay." *E.* Add the spirit to the assafœtida previously triturated with the water, macerate for fourteen days, and filter, *D.*)—Stimulant and antispasmodic. Used in hysteria and flatulent colic. Dose ʒss. to fʒij. Pennyroyal is a good vehicle for it. When mixed with aqueous liquids, it becomes milky, owing to the deposition of the hydrated resin.

4. *Pilulæ Assafœtidæ*, E. *Pilulæ Galbani Compositæ*, L. D. (Assafœtida; Galbanum; and Myrrh, ℥iij. of each; Conserve of Red Roses, ℥iv. or a sufficiency; mix them, and beat them into a proper pill mass, *E.*—Galbanum, ℥i., Myrrh, Sagapenum, of each ʒjss.; Assafœtida, ℥ss.; Syrup [Treacle, *D.*] as much as may be sufficient. Beat them together until incorporated. *L. D.*)—As the most powerful ingredient of this combination is assafœtida, the more appropriate name for the pills would be *pilulæ assafœtidæ compositæ*. This compound is stimulant and antispasmodic. It is used in hysteria, chlorosis, &c. Dose, grs. x. to ℈j.

5. *Pilulæ Aloes et Assafœtidæ*, Ed., see p. 649.

6. *Spiritus Ammoniæ fœtidus*, L. E. D. (The formulæ of the London and Dublin Colleges have been before given, [see p. 173.] "Take of Spirit of Ammoniæ, f℥xss.; Assafœtida, ℥ss. Break the assafœtida into small fragments, digest it in the spirit for twelve hours, and distil over ten fluidounces and a half by means of a vapour-bath heat." *E.*)—For effects, uses, &c. see p. 173.

7. *Emplastrum Assafœtidæ*, E. (Litharge Plaster; Assafœtida, of each ℥ij.; Galbanum; Bees'-wax, of each ℥ij. Liquefy the gum-resins together, and strain them; then add the plaster and wax also in the fluid state, and mix them all thoroughly.)—It is applied, as an antispasmodic, over the stomach or abdomen in hysteria with flatulence, to the chest or between the shoulders in hooping-cough.

Fer'ula? *An Uncertain Species, yielding Sagapenum*, L.

Sex. Syst. Pentandria, Digynia.
(Gummi-resina, *L. D.*)

History.—Sagapenum (σαγάπηνον) is mentioned both by Hippocrates (p. 626, ed. Fæs.) and Dioscorides (lib. iii. cap. 95). Pliny (*Hist. Nat.* lib. xx. cap. 75, ed. Valp.) calls it *Sacopenium.* Dioscorides says it is a liquor obtained from a ferulaceous plant growing in Media.

Botany.—Nothing is known with respect to the plant yielding sagapenum. Willdenow considered it to be *Ferula persica*, and he has been followed by Sprengel and Fée. But his opinion was not supported by any well ascertained fact; on the contrary, several circumstances already mentioned (p. 1042) seem to show that this plant produces a kind of asafœtida. There is, indeed, no evidence to prove that sagapenum is got from a *Ferula*, for the statement of Dioscorides cannot be admitted as having much weight.

Description.—Two kinds of sagapenum (*sagapenum; gummi sagapenum*) are occasionally met with. The finest (*sagapenum in the tear*), consists of masses made up of agglutinated, brownish yellow, semi-transparent tears, and resembling galbanum, but having a darker colour and a more alliaceous odour. A commoner kind (*soft sagapenum*), occurs in soft, tough masses, in which no distinct tears are distinguishable. When heated on the point of a knife in the candle, sagapenum gives out a much more aromatic and agreeable odour than galbanum. It has a hot and acrid taste. It is imported from the Levant.

Composition.—Sagapenum has been analyzed by Pelletier (*Bull. de Pharm.* iii. 481); and by Brandes (Gmelin, *Handb. d. Chem.* ii. 625).

Pelletier's Analysis.	
Resin	54·26
Gum	31·94
Volatile oil and loss	11·80
Bassorin	1·00
Malate of lime	0·40
Peculiar matter	0·60
Sagapenum	100·00

Brandes's Analysis.	
Resins	50·29
Gum, with calcareous salts	32·72
Volatile oil	3·73
Bassorin	4·48
Malate and phosphate of lime	1·12
Impurities	4·30
Water	4.60
Sagapenum	101·24

1. *Oil of Sagapenum.*—Pale yellow, lighter than water, soluble in alcohol and ether. Has a strong alliaceous odour, and a mild (afterwards hot) bitter, alliaceous taste. Sulphuric acid renders it dark red.

2. *Resins of Sagapenum.*—These are two in number: one insoluble, the other soluble in ether.

α. *Resin insoluble in ether.*—Brownish-yellow, tasteless, odourless, fusible, soluble in warm liquor potassæ and in spirit, but insoluble in the oils of turpentine and almonds.

β. *Resin soluble in ether.*—Reddish-yellow, with a feeble odour of sagapenum, and a mild (afterwards bitter) taste. It is soluble in spirit, and slightly so in the oils of turpentine and almonds. It dissolves in sulphuric acid, forming a blood-red solution, from which water separates a violet substance.

Physiological Effects and Uses.—Its effects and uses are the same as those of asafœtida. It is usually considered to hold an intermediate rank between asafœtida and galbanum; but it is rarely employed.

Administration.—It is given in substance, in the form of pill, in doses of from grains v. to ℈j. or ʒss.

Pilulæ Sagapeni compositæ, L. (Sagapenum, ℥j.; Aloes, ʒss.; Syrup of Ginger, as much as may be sufficient. Beat them together until incorporated.)—This preparation corresponds to the *Pilulæ Aloës et Asafœtidæ*, E. (p. 649); the latter, however, being more active. It is used as a warm stimulating purgative in dyspepsia, with flatulence and costiveness. Dose grains v. to ℈j.

Dore'ma Ammoni'acum, Don, L. E.—*The Ammoniacum Dorema.*

Sex. Syst. Pentandria, Digynia.

(Gummi-resina, *L.*—Gummy-resinous exudation, *E.*)

History.—The term *ammoniacum* has been applied to two different gum-resins; one, the produce of *Ferula tingitana;* the other, of *Dorema Ammoniacum.* The first is the ammoniacum of Hippocrates (p. 670, ed. Fæs.), Dioscorides (lib. iii. cap. 98), and Pliny (*Hist. Nat.* lib. xii. cap. 49, ed. Valp.); the latter is the commercial ammoniacum of the present day.

Dioscorides says ἀμμωνιακόν is obtained from a species of *Ferula*, which he calls ἀγασυλλῖς, growing near Cyrene, in Africa. Pliny terms the plant *Metopion*, and says it grows in that part of Africa which is subject to Æthiopia, near the temple of Jupiter Hammon (or Ammon), which, as well as the gum-resin, received its name from ἀμμος, *sand*, on account of the sandy soil of the country. Both Dioscorides and Pliny mention two kinds of ammoniacum; the best, called *Thrauston* (θραῦσμα) resembled olibanum, and had an odour like castoreum, and a bitter taste; and the commonest, termed *Phyrama* (φύραμα) had a resinous appearance, and was adulterated with earth and stones. *African ammoniacum* (in Arabic, *Fasògh* or *Feshook*) is, Dr. Lindley informs me, "certainly the produce of Ferula tingitana."

I have not been able to ascertain when *Persian ammoniacum* (the produce of *Dorema Ammoniacum*) first came into use. As the Greeks and Romans make no mention of it, they were, probably, unacquainted with it. Avicenna (lib. ii. cap. 8) does not mention the origin of his ammoniacum (*assach*, Arab.) The ammoniac (*eschak*, Arab.) of Abu Mansur Mowajik (*Lib. Fund. Pharm.* i. 35, ined. R. Seligmann, 1830), an ancient Persian physician, who wrote about 1055, A. D., was doubtless the Persian kind; as was also the ammoniac (*derukht ushuk*) of Bevan Ben Khuas Khan, A. D. 1512 (Ainslie, *Mat. Ind.* i. 160). The Arabic terms (*assach*, *eschak*, and *ushuk*,) by which the three last named authors designate ammoniac, closely resemble that (*oshac*) by which the ammoniacum plant is now known in Persia (*Linn. Trans.* vol. xvi. 605); hence we infer they all referred to the same object.

Botany. *Gen. Char.*—Epigynous *disk*, cup-shaped. *Fruit* slightly compressed from the back, edged; with three distinct, filiform, primary ridges near the middle, and, alternating with them, four obtuse secondary ridges; the whole enveloped in wool. *Vittæ*, one to each secondary ridge, one to each primary marginal ridge, and four to the commissure, of which two are very small (Lindley).

Sp. Char.—The only species.

A glaucous green plant, about seven feet high, looking like the Opoponax. *Root* perennial. *Stem* about four inches in circumference at the base. *Leaves* large, petiolate, somewhat bipinnate, two feet long; pinnæ in three pairs; petioles downy, sheathing at the base. *Umbels* proliferous, racemose; partial ones globose, or short stalks, often arranged in a spiked manner. *Involucre*, general or partial, none. *Petals* white. *Stamens* and *styles* white. *Ovaries* buried in wool. *Fruit* naked. (Condensed from Don).

Hab.—Persia, in the province of Irak, near Jezud Khast, and on the plains between Yerdekaust and Kumisha.

Extraction.—The whole plant is abundantly pervaded with a milky juice, which oozes forth upon the slightest puncture being made, even at the ends of the leaves. This juice when hardened constitutes ammoniacum. Through the kindness of my friend Dr. Lindley, I have in my museum the upper part of the (apparently flowering) stem, about ten inches long, with lumps of ammoniacum sticking to it at the origin of every branch. It was gathered by Sir J. McNiell, in Persia (I believe between Ghorian and Khaff). It does not appear that artificial incisions are ever made in the stem. Lieut.-Col. Kennett (*Linn. Trans.* xvi. 605) says, "When the plant has attained perfection, innumerable beetles, armed with an anterior and posterior probe of half an inch in length, pierce it in all directions; it [ammoniacum] soon becomes dry, and is then picked off, and sent *viâ* Bushire to India, and various parts of the world."

Commerce.—Ammoniac is usually imported from Bombay, but occasionally it comes from the Levant. It is brought over in chests, cases, and boxes. The quantity imported is but small.

Description.—Common or Persian ammoniacum, usually termed *gum ammoniacum* or *ammoniac* (*gummi ammoniacum*) occurs in two forms; *in the tear* and *in the lump*.

α. *Ammoniacum in the tear* (*ammoniacum in lachrymis* seu *granis*) occurs in distinct dry tears, usually more or less spheroidal, though frequently of irregular forms, varying in size from that of the fruit of coriander (or even smaller) to that of a walnut. Externally they are of a yellow (pale reddish or brownish) colour, with a waxy lustre; internally they are white or opalescent, opaque, or only feebly translucent at the edge of thin films. At ordinary temperatures, it is moderately hard and brittle, but softens like wax in the hand.

β. *Lump Ammoniacum* (*ammoniacum in placentis* seu *massis*). This occurs in masses usually composed of agglutinated tears, whose properties it possesses. It is sometimes met with in soft plastic masses, of a darker colour, and mixed with various impurities. To separate these, it is melted and strained (*Strained Ammoniacum; Ammoniacum colatum*).

Both kinds have a faint, unpleasant, peculiar odour, by which this gum-resin may be readily distinguished from all other. This odour is best detected by heating the ammoniacum on the point of a pen-knife. The taste is bitter, nauseous, and acrid. Umbelliferous fruits are not unfrequently found intermixed with both sorts. In most of its other properties ammoniacum agrees with other gum-resins (see p. 75.)

I am indebted to Dr. Lindley for a fine sample of *African Ammoniacum* (ἀμμωνιακόν, Diosc.) It was sent by W. D. Hays, Esq., the British Consul at Tangier, to the Hon. W. T. Fox Strangways, and is marked "*Gum Ammoniac* or *Fusògh*, Tangier, 17 June, 1839, J. W. D. H." It is an oblong piece, about three inches long, and one and a half inches thick, and broad. Its weight is about 830 grains. Externally it is irregular and uneven, and has a dirty appearance, similar to what ammoniacum would acquire from repeated handling and long exposure to the air in a dusty situation. It is partially covered with paper. A few pieces of reddish chalky earth (which effervesces with acids) are found sticking to it, thus confirming the account given of it by Jackson (*Account of the Empire of Morocco*, 3d ed. p. 156), though the quantity of this on my specimen is not sufficient to affect in any way the unsaleability of it. It appears to be made up of agglutinated tears, like the lump Persian ammoniacum. Internally it has very much the appearance of lump ammoniacum, but is not so white, but has a brownish, reddish, and in some places a faint blueish tint. Its odour is very faint, and not at all like Persian ammoniacum. Heated on the point of a knife, its distinction from Persian ammoniacum is very obvious. Its taste is also much slighter than that of the commercial ammoniacum. Rubbed with water, it forms an emulsion like the latter. It is the produce of *Ferula tingitana* (Lindley).

Composition.—Ammoniacum has been analyzed by Calmeyer, Bucholz (Gmelin, *Handb. d. Chem.* ii. 624), Braconnot (*Ann. de Chem.* lxviii. 69), and by Hagen (Schwartze, *Pharm. Tabel.* 280, 2te Ausg.)

Braconnot's Analysis.		*Hagen's Analysis.*	
Resin	70·0	Resin	68·6
Gum	18·4	Gum	19·3
Gluteniform matter, insoluble in water and alcohol	4·4	Gluten (colla)	5·4
Water	6·0	Extractive	1·6
Loss	1·2	Sand	2·3
		[Volatile oil and water	2·8]
Ammoniacum	100·0	Ammoniacum	100.0

1. *Volatile Oil of Ammoniacum.*—Transparent, lighter than water.

2. *Resin of Ammoniacum.*—Reddish-yellow, tasteless, has the odour of the gum-resin. Soluble in alkalies and alcohol; partially soluble in ether and the oils (fixed and volatile).

Physiological Effects.—The effects of ammoniacum are similar to, though less powerful than, those of asafœtida (p. 1045) and of the other fetid gum-resins already (p. 75) mentioned. MM. Trousseau and Pidoux (*Traité de Thérap.* p. 19) assert that in all the cases in which they have employed it, it had no stimulant effect either local or general. "We have taken," say these authors, "two drachms of this substance at once, without experiencing any of those accidents complaisantly indicated by authors." I would remark, however, that the local irritation produced by the plaster of ammoniacum is known to most practitioners,—a papular eruption being a frequent result of the application of this agent. Ammoniacum contains much less volatile oil than either asafœtida or galbanum; its stimulant influence is less than either of these. Full doses of it readily disturb the stomach.

Uses.—Though applicable to all the same cases as asafœtida (p. 1046) and the other fetid gum-resins (p. 75), its internal use is principally or almost solely confined to chronic pulmonary affections. It is not fitted for irritation or inflammation of the bronchial membrane. But in chronic coughs, with deficient expectoration, or in chronic catarrhs and asthmatic cases of old persons with profuse secretion, it sometimes gives slight relief. Though I have seen it extensively employed, in a few cases only have I observed it beneficial. As a topical, discutient, or resolvent application, in the form of plaster, to glandular enlargements, indolent affections of the joints, &c. it occasionally proves useful.

ADMINISTRATION.—The dose of ammoniacum is from grs. x. to ℈ss. It may be given in the form of pill or emulsion. It is a constituent of the *compound pills of squills*, (see p. 655) a very useful expectorant in old catarrhs.

1. *MISTURA AMMONIACI*, L. D. *Lac Ammoniaci* (Ammoniacum, ℈v. [ʒj. *D.*]; Water, Oj. [Pennyroyal Water, f℥viij. *D.*] Rub the ammoniacum with the water gradually poured on, until they are perfectly mixed. [It should be strained through linen, *D.*])—The resinous constituent of ammoniacum is more effectually suspended in water by the aid of the yolk of an egg. This mixture operates as a stimulant to the bronchial membrane, and is used as an expectorant in chronic coughs, humoral asthma, &c. It is a convenient and useful vehicle for squills or ipecacuanha. Dose f℈ss. to f℈j.

2. *EMPLASTRUM AMMONIACI*, L. E. D. (Ammoniacum, ℥v.; Distilled Vinegar, f℥viij.; [f℥ix. *E.*; Vinegar of Squill, Oss. *D.*] Dissolve the ammoniacum in the vinegar, then evaporate the liquor [in an iron vessel, *E.*] with a slow fire, [over the vapour bath, *E.*] constantly stirring, to a proper consistence.)—A very adhesive, stimulant, and discutient or resolvent plaster. It sometimes causes an eruption. It is applied to indolent swellings, as of the glands and joints. A very useful application to the housemaid's swollen knee.

3. *EMPLASTRUM AMMONIACI CUM HYDRARGYRO*, L. E. D. (The formulæ of the London and Dublin Colleges have been before given [see p. 458]. The formula of the Edinburgh College is similar to that of the London College).—For its effects and uses, see p. 458.

Ane'thum grave'olens, Linn. L. E.—*Common* or *Garden Dill.*

Sex. Syst. Pentandria, Digynia.

(Fructus, *L.*—Fruit, *E.*)

HISTORY.—This plant is mentioned by Hippocrates (*Opera*, p. 359, ed. Fæs.), by Dioscorides (lib. iii. cap. 67), and by Pliny (*Hist. Nat.* lib. xx. cap. 74, ed. Valp.) It is also noticed in the New Testament (*Matt.* xxiii. 23.)

BOTANY. *GEN. CHAR.*—Margin of the *calyx* obsolete. *Petals* roundish, entire, involute, with a squarish retuse lobe. *Fruit* lenticular, flattened from the back, surrounded by a flattened border. *Mericarps* [half-fruits] with equidistant, filiform ridges; the three intermediate [dorsal] acutely keeled, the two lateral more obsolete, losing themselves in the border. *Vittæ* broad, solitary in the channels, the whole of which they fill, two on the commissure. *Seeds* slightly convex, flat in front. Smooth erect *annuals*. *Leaves* decompound, with setaceous linear lobes. *Involucre* and *involucellæ* none. *Flowers* yellow (D. C.)

SP. CHAR.—*Fruit* elliptical, surrounded with flat dilated margin (D. C.)

Root tapering, long. *Stem* one a half to two feet high, finely striated, simply branched. *Leaves* tripinnated; segments fine capillary; leaf-stalks broad and sheathing at the base. The plant greatly resembles common fennel, though its odour is less agreeable.

Hab.—South of Europe, Astracan, Egypt, Cape of Good Hope, Timor, &c. Probably migratory. Cultivated in England.

Description.—The fruit, commonly called *dill seed* (*fructus seu semina anethi*) is oval, flat, dorsally compressed, about a line and a half long, and from a half to one line broad, brown, and surrounded by a lighter-coloured membranous margin (*ala*). Each mericarp (or half-fruit) has five primary ridges, but no secondary ones. In each channel is one vitta, and on the commissure are two vittæ. These vittæ contain the aromatic oil. The odour of the fruit is strongly aromatic; the taste warm and pungent.

Composition.—Dill owes its peculiar properties to a volatile oil.

Oil of Dill (*Oleum Anethi*). Is pale yellow. Its sp. gr. is 0·881. Its odour is peculiar and penetrating, analogous to that of the fruit. Its taste is hot but sweetish. Alcohol and ether readily dissolve it. According to Tietzmann 1440 parts of water dissolve one part of this oil.

Physiological Effects.—Aromatic stimulant, carminative and condimentary, analogous to other aromatic umbelliferous fruits (see p. 72).

Uses.—Employed as a condiment by the Cossacks. Loudon (*Encyclo. of Gard.*) says the leaves "are used to heighten the relish of some vegetable pickles, particularly cucumbers; and also occasionally in soups and pickles."

In medicine it is principally employed in the diseases of children. It is a common domestic remedy among nurses, to relieve flatulence and griping of infants. Occasionally it is taken under the idea of its promoting the secretion of milk. Practitioners generally use dill as a vehicle for the exhibition of purgative and other medicines to children, the griping of which it assists in preventing. The whole fruits may be given to adults in doses of ten grains to a drachm.

1. *Oleum Anethi*, E. (Obtained by submitting the bruised fruit of dill, with water, to distillation).—Two *cwts.* of the fruit yield 8 lbs. 5 ozs. of oil (*Private information*). Principally used to prepare dill water. May be taken in the dose of a few drops on sugar, or dissolved in spirit.

2. *Aqua Anethi*, L. E. (Dill, bruised, lb. iss. [℥xviij. *E.*]; Proof Spirit, f℥vij. [Rectified Spirit, f℥iij. *E.*]; Water, *Cong.* ij. Mix. Let a gallon distil.)—This compound is usually prepared by diffusing the oil through water by the aid of sugar or spirit. Carminative. Dose, for adults, f℥j. to f℥iij; for infants, fʒj. to fʒiij. It is generally given to infants with their food.

Gal'banum officina'le, Don, L. E.—*The Officinal Galbanum.*

Sex. Syst. Pentandria, Digynia.

(Gummi-resina, *L. D.*—Concrete gummy-resinous exudation, *E.*)

History.—Galbanum is mentioned by Moses (*Exodus*, xxx. 34) who ranks it among the sweet spices. It was used in medicine by Hippocrates (401, &c. ed. Fæs.); Dioscorides (lib. iii. 97) says it (χαλβάνη) is the μετώπιον, growing in Syria.

Botany.—Hitherto no sufficient evidence has been adduced to prove that galbanum is yielded by any known plant. "The *Bubon Galbanum* of Linnæus possesses neither the smell nor the taste of Galbanum, but in these particulars agrees better with Fennel, and the fruit has no resemblance whatever to that found in the gum." (Don, *Linn. Trans.* xvi.

603). The *Dublin College*, therefore, is in error in referring this gum-resin to Bubon Galbanum. Mr. Don found an umbelliferous fruit in the galbanum of commerce, which he believes to be that of the plant yielding this gum-resin, and as it constitutes a new genus, he has called it *Galbanum officinale.* The following are the characters of the fruit:

Fruit compressed at the back, elliptical; *ridges* seven, elevated, compressed, bluntly keeled, not winged; the lateral distinct, marginal. *Channels* broadish, concave, without vittæ. *Commissure* flat, dilated, bivittate: *vittæ* broad, somewhat curved. (Don.)

But though it is not at all probable that these fruits are the produce of the galbanum plant, yet no proof of this has been hitherto adduced, and Dr. Lindley, therefore, very properly asks, "Did the fruit found by Mr. Don upon the gum really belong to it?" (*Fl. Med.* 51).

More recently Sir John McNiell sent home specimens of a plant called *a second sort of ammoniacum*, gathered near Durrood, July 27, 1838, to the branches of which are sticking lumps of a pale yellow waxy gum-resin, which Dr. Lindley took for galbanum; and the plant which yields it being essentially different from all others, has been named by him *Opöidia galbanifera* (*Botanical Register* for August 1, 1839, p. 65-6). Dr. Lindley was kind enough to send me a small fragment of this gum-resin for examination, but I was unable to identify it with any other known product of the order Umbelliferæ. It certainly was neither asafœtida nor ammoniacum; nor did it appear to me to be either sagapenum or galbanum.

The precise country where galbanum is produced has not been hitherto ascertained. Dioscorides says it is obtained in Syria; a statement which is perhaps correct, though hitherto no evidence of this has been obtained. It is not improbable that it is also procured in Persia, or even in Arabia, as suggested by Dr. Royle. Opöidia galbanifera grows in the province of Khorasan, near Durrood.

Extraction.—Geoffroy (*Trait. de Mat. Méd.* ii. 623) says, though I know not on whose authority, that galbanum is generally obtained by making an incision into the stalks about three fingers breadth above the root, from which it issues in drops, and in a few hours becomes dry, and hard enough to gather.

Description.—The gum-resin galbanum (*galbanum* seu *gummi-resina galbanum*) occurs in the two forms of tears and lump.

α. *Galbanum in the tear* (*galbanum in lachrymis* seu *granis*) is rare: it occurs in distinct, round, yellow or brownish yellow, translucent tears; none of which, in my collection, exceed the size of a pea. Their fracture is feebly resinous and yellow.

β. *Lump Galbanum* (*galbanum in massis*) is the ordinary galbanum of commerce. It consists of large irregular masses of a brownish or dark brownish yellow colour, and composed of agglutinated tears, some few of which, when broken, are observed to be translucent and blueish, or pearl-white. The mericarps, pieces of the stem, &c. are found intermixed with the tears. To separate these, galbanum is melted and strained (*strained galbanum; galbanum colatum.*)

The odour of both kinds is the same; viz. balsamic, and peculiar. The taste is hot, acrid, and bitter. When exposed to cold, galbanum becomes brittle, and may be reduced to powder. In many of its other properties, it agrees with the other gum-resins. It is imported from the Levant and from India, in cases and chests.

Composition.—Galbanum has been analyzed by Neumann (Pfaff, *Syst. d. Mat. Med.* iii. 294), Pelletier (*Bull. de Pharm.* iv. 97), Fiddechow, and Meissner (Schwartze, *Pharm. Tabel.* 284, 2te Ausg.)

Pelletier's Analysis.

Resin	66·86
Gum	19·28
Volatile oil and loss	6·34
Wood and impurities	7·52
Supermalate of lime	traces
Galbanum	100·00

Meissner's Analysis.

Resin	65·8
Gum	22·6
Bassorin	1·8
Volatile oil	3·4
Bitter matter with malic acid	0·2
Vegetable remains	2·8
Water	2·0
Loss	1·4
Galbanum	100·0

1. *Volatile Oil of Galbanum.*—Obtained by submitting the gum-resin, with water, to distillation. It is colourless and limpid. Its sp. gr. is 0·912: its odour is like that of galbanum and camphor; its taste is hot, afterwards cooling and bitterish. It is soluble in spirit, ether, and the fixed oils.

2. *Resin.*—Is the residue obtained by boiling the alcoholic extract of galbanum in water? It is dark yellowish-brown, transparent, brittle, and tasteless; soluble in ether and alcohol, scarcely so in spirit containing 50 per cent. of water, or in almond oil. Very slightly soluble in oil of turpentine, even when aided by heat. It dissolves in oil of vitriol, forming a dark yellowish-brown liquid. According to Pelletier, galbanum-resin has the remarkable property of yielding an indigo-blue oil when heated to 248° F. or 266° F.

Physiological Effects.—The general effects of galbanum are those of the fœtid antispasmodic gum-resins already described (p. 75). It is usually ranked between asafœtida and ammoniacum, being weaker than the former, but stronger than the latter. As it yields, by distillation, more volatile oil than asafœtida does, it has been supposed that it must exceed the latter in its stimulant influence over the vascular system; but as an antispasmodic, it is decidedly inferior to asafœtida. A specific stimulant influence over the uterus has been ascribed to it: hence the Germans call it *Mutterharz* (i. e. *uterine resin*).

Uses.—Galbanum is principally adapted for relaxed and torpid habits, and is objectionable in inflammatory or febrile disorders. It is employed in the same cases as asafœtida (p. 1046), with which it is generally given in combination. It is principally used in chronic mucous or pituitous catarrh, in which it oftentimes proves serviceable. It has also been employed in amenorrhœa and chronic rheumatism. Externally it is applied as a mild stimulant, resolvent, or suppurant, in indolent swellings.

Administration.—It may be given in *substance*, in the form of pill, in doses of from grs. x. to ʒss., or in the form of *emulsion*.

1. Tinctura Galbani, D. (Galbanum, cut very small, ℥ij.; Proof Spirit, Oij. [wine measure]. Digest for seven days, and filter).—Stimulant and antispasmodic. "Used for the same purposes as the tincture of asafœtida, than which it is less nauseous and less powerful." Dose, fʒj. to fʒiij.

2. Pilulæ Galbani compositæ, L. D. [see *Pilulæ Assafœtidæ*, E.]

3. Emplastrum Galbani, L. D. *Emplastrum gummosum*, E. (Galbanum, ℥viij.; Plaster of Lead, lb.iij.; Common Turpentine, ʒx.; Resin of the Spruce Fir, powdered, ℥iij. Add first the Resin of the Spruce Fir, then the Plaster of Lead melted with a slow fire, to the Galbanum and Turpentine melted together, and mix them all, *L.*—" Litharge plaster,

℥iv.; ammoniac, galbanum, and bees' wax, of each ʒss. Melt the gum-resins together, and strain them: melt also together the plaster and wax; add the former to the latter mixture, and mix the whole thoroughly." *E.*—Litharge Plaster, lb. ij.; Galbanum, lb. ss.; Scrapings of Yellow Wax, ℥iv. Melt the galbanum, and add the litharge plaster and wax; then melt them together with a medium heat, and strain, *D.*)—This plaster, spread upon leather, is applied to indolent tumours, to promote their suppuration, and to disperse them. Its operation appears to be that of a mild stimulant. It is also applied to the chest in chronic pulmonary complaints. In weakly, rickety children, with weakness of the lower extremities, it is applied to the lumbar region.

Cu'minum Cy'minum, Linn. L. E.—*The Officinal Cumin.*

Sex. Syst. Pentandria, Digynia.

(Fructus, *L.*—Fruit, *E.*)

History.—This plant is mentioned in both the Old and New Testament (*Isaiah* xxviii. 27; *Matthew* xxiii. 23), and by Hippocrates (*Opera*, 407, &c. ed. Fœs.), Dioscorides (lib. iii. cap. 68), and Pliny (*Hist. Nat.* lib. xix. cap. 47, ed. Valp.) The Greeks call it κύμινον ἥμερον vel αἰθιοπικὸν.

Botany. *Gen. Char.*—Teeth of the *calyx* five, lanceolate, setaceous, unequal, persistent. *Petals* oblong, emarginate, erect, spreading, with an inflexed lobe. *Fruit* contracted at the side. *Mericarps* [half fruits] with wingless ridges; the primary ones five, filiform, minutely muricated, the laterals forming a border; the secondary ones four, more prominent, and aculeate. *Channels* under the secondary ridges one-vittate. *Carpophorus* bipartite. *Seed* somewhat concave anteriorly, on the back convex.—*Herbs. Leaves* many-cleft; lobes linear, setaceous. Leaflets of the *involucre* two to four, simple or divided. *Involucellum* halved, two- to four-leaved, becoming reflexed. *Flowers* white or pink (D. C).

Sp. Char.—Lobes of the *leaves* linear, setaceous, acute. *Umbel* three- to five-cleft *Partial involucre* equalling the pubescent fruit (D. C.)

Root annual. *Stem* slender, branched, about a foot high. *Leaves* filiform. *Flowers* white or reddish.

Hab.—Upper Egypt, Ethiopia. Extensively cultivated in Sicily and Malta.

Description,—The fruit, commonly termed *cumin seeds* (*fructus* seu *semina cumini*), is larger than anise, and of a light-brown or grayish-yellow colour. It has some resemblance to, though it is larger than, caraway. Each mericarp has five primary ridges, which are filiform, and furnished with very fine prickles. The four secondary ridges are prominent and prickly. Under each of these is one vitta. The odour of the fruit is strong and aromatic. Both odour and taste are somewhat analogous to, but less agreeable than, caraway. Cumin is imported from Sicily and Malta. In 1839, duty (2s. per cwt.) was paid on 53 cwts.

Composition.—The peculiar properties of cumin reside in a volatile oil.

Volatile Oil of Cumin (*Oleum Cumini*) is pale-yellow and limpid. Its sp. gr. is 0·975. Its smell is disagreeable; its taste very acrid. With fuming nitric acid it yields, under great frothing, a white resin. Chevallier found, in some very old oil of cumin, succinic acid.

Physiological Effects.—Cumin agrees with the other aromatic umbelliferous fruits (see p. 72) in its mild stimulant and carminative qualities.

Uses.—Internally cumin is rarely used; caraway being an equally efficient, and much more agreeable medicine. As a discutient and resolvent, it was formerly employed, externally, in the form of *plaster* (*emplastrum cumini*, Ph. L. 1824) and *cataplasm* (*cataplasma e cymino*, Quincy). As there is now no preparation of cumin in the British pharmacopœia, I am surprised at the retention of this substance in the Materia Medica. The dose of cumin is grs. xv. to ʒss. It is principally used in veterinary surgery.

Dau'cus Caro'ta, Linn. L. D.—*Common* or *Wild Carrot.*

Sex. Syst. Pentandria, Digynia.

(Fructus; Radix recens, *L.*—Radix, *D.*)

D. Carota, var. *sativa*, Decandolle, *E.* (Root).

D. Carota, var. *sylvestris*, D. (Semina).

History.—According to Dr. Sibthorp (*Prodr. Fl. Græc.* i. 183), this plant is the σταφυλῖνος of Dioscorides (lib. iii. cap. 59). Hippocrates (686, ed. Fœs.) employed it in medicine under the same name. The σταφυλῖνος ἄγριος of Dioscorides is, according to Dr. Sibthorp, the *Daucus guttatus.*

Botany. *Gen. Char.*—Margin of the *calyx* five-toothed. *Petals* obovate, emarginate, with an inflexed point; the outer generally radiating, and deeply bifid. *Fruit* somewhat compressed from the back, ovate or oblong. *Mericarps* [half fruits] with the five primary ridges filiform and bristly; the three middle ones at the back; the two laterals on the plane of the commissure; the four secondary ridges equal, more prominent, winged, split into a simple row of spines. *Channels* beneath the secondary ridges one-vittate. *Seed* anteriorly flattish.—Usually biennial herbs. *Leaves* bipinnatisect. *Involucre* of many, tri-, or pinnatifid leaflets; partial involucre of many, entire, or trifid leaflets. *Flowers* white or yellow; the central generally fleshy, blackish purple, sterile (D. C.)

Sp. Char.—*Stem* hispid. *Leaves* two- or three-pinnatisect; the segments pinnatifid; the lobes lanceolate, cuspidate, almost equal to the umbel. *Prickles* equal to the diameter of the oblong-oval fruit (D. C.)

Root slender, yellowish, aromatic, and sweetish. *Stem* two or three feet high, branched, erect, leafy, hairy or bristly. *Leaves* on broad, concave, ribbed footstalks, distantly hairy. *Umbels* large, white, except the one central neutral *flower*, which is blood-red. *Fruit* small, protected by the incurvation of the flower-stalks, by which the umbels are rendered hollow, like a bird's nest.—(Condensed from Smith.)

Hab.—Indigenous; in pastures and the borders of fields, in a gravelly soil, common. Europe, Crimea, and the Caucasus; from thence, probably, carried to China, Cochin-China, and America.

Dau'cus Caro'ta, var. *sativa*, D. C.; E. *Cultivated* or *Garden Carrot.*—This has a thick succulent root, whose colour varies. Loudon mentions ten garden varieties.

Description.—The officinal *root* is that of the cultivated plant (*radix dauci sativi*). It is tap-shaped, now and then branched, reddish or pale straw-coloured, succulent, of a peculiar, not unpleasant, odour, and a sweet, mucilaginous, agreeable taste. *Carrot juice* (*rob dauci*) is reddish, turbid, with the odour and taste of the root. It coagulates at a temperature under 212° F. The coagulum is yellow, and when dried amounts to 0·629 of the juice. The root of the wild or uncultivated carrot is small, woody, acrid, and bitter, with a strong aromatic odour. The officinal *fruits*, usually called *carrot seeds* (*fructus* seu *semina dauci sylvestris*) are those of the wild carrot: they are brownish, from one to one and a half lines long, with a peculiar and aromatic odour, and a bitter and warm taste. Their other characters have been described (p. 1058). The seeds of the cultivated carrot are much milder.

Composition.—The *fruit* (commonly termed *seeds*) have not been analyzed: they owe their peculiar properties to volatile oil (*oleum seminum dauci sylvestris*). The *root* has been analyzed by Vauquelin (*Ann. de Chim. et Phys.* xli. 46), by Wackenroder (Gmelin, *Handb. d. Chem.* ii. 1277), and by C. Sprengel (*Pharm. Centr.-Blatt für* 1832, 443). The constituents of the expressed juice, evaporated to dryness, are, according to Wackenroder: *fixed oil with some volatile oil* 1·0, *carotin* 0·34, *uncrystallizable sugar* with some *starch* and *malic acid* 93·71, *albumen* 4·35, *ashes* composed of alumina, lime, and iron 0·60.

1. *Volatile Oil of Carrot-Root.*—Colourless, has a smell of carrots, a strong, permanent, unpleasant taste, and a sp. gr. of 0·8863 at 54° F. It is little soluble in water, but very soluble in alcohol and ether. From 34 lbs. of the fresh root only half a drachm of oil was obtained. It is probable that the *volatile oil of carrot-fruits* possesses analogous properties.

2. *Carotin.*—A crystalline, ruby-red, tasteless, odourless, neutral substance. It is fusible and combustible, but not volatile, soluble in the fixed and volatile oils, slightly so in alcohol, not in ether unless fat oil be present. Its solutions are decolorized by solar light.

3. *Pectic Acid.*—By the action of alkalies on the ligneous tissue of carrots, Braconnot procured *pectic acid.* I have repeated his experiments, and can confirm his statements, but the quantity obtained is small.

Physiological Effects and Uses.—The fruit (*seed* of the shops) of the carrot is an aromatic stimulant and carminative, like the other aromatic umbelliferous fruits (see p. 72). Aretæus says it possesses diuretic properties, a statement confirmed by Eberle (*Mat. Med.* ii. 260, 2nd ed.) They have been employed in suppressions of urine and painful micturition, and also in dropsies.

The boiled *root* is a well-known article of food. Raw scraped carrot is sometimes applied to chapped nipples; it is a stimulant, and occasionally proves a painful application. Boiled carrots are only employed in the form of poultice (*cataplasma dauci*).

Cataplasma Dauci, D.—(Root of Cultivated Carrot, any quantity. Boil the root in water until it becomes soft enough to form a cataplasm). It is used to correct the fetid discharge, allay the pain, and change the action of ill-conditioned, phagedenic, sloughing, and cancerous ulcers (see *Med. Observ. and Inq.* vol. iv. pp. 184-191, and 358).

Co'nium macula'tum*, Linn., L. E. D.—*The Common or Spotted Hemlock.*

History.—This plant is usually supposed to be the κώνειον of the Greek writers, the celebrated *Athenian state poison*, by which Socrates (*Works of Plato*, by T. Taylor, vol. iv. *The Phædo*, p. 340) and Phocion

* Usually pronounced *Coni'um.*

(*Plutarch's Lives*) died, and the *cicuta* of the Roman authors. Various reasons contribute to give the common opinion on this point a high degree of probability. Dioscorides (lib. iv. cap. 79) described the plant sufficiently well to prove it must have been one of the Umbelliferæ; and he tells us it had a heavy odour, and a fruit like that of anise. The latter simile applies to our Conium, for a very intelligent druggist mistook, in my presence, the fruit of the hemlock for that of anise; and at the examination for M. B. at the University of London in 1839, a considerable number of the candidates to whom the hemlock fruit was shown, made the same mistake. Dioscorides also tells us that the κώνειον of Crete and Megara was the most powerful, and next to this came that of Attica, Chio, and Cilicia. Now Dr. Sibthorp (*Prodr. Fl. Græcæ*, i. 187) found Conium maculatum growing near Constantinople, not unfrequently in the Peloponnesus, and most abundantly between Athens and Megara. So that the locality of our Conium agrees, as far as has been ascertained, with that of the ancient plant. We may gather from the poetical account of the effects of κώνειον given by Nicander (*Alexipharmaca*, f. 34-5, Paris, 1549) that this plant "brings on obliteration of the mental faculties, dimness of sight, giddiness, staggering, stifling, coldness of the limbs, and death by asphyxia; a view of its effects," says Dr. Christison (*Trans. Royal Soc. Edinb.* vol. xiii.) "which differs little from the modern notions of the poisonous action of the spotted hemlock." It is also remarkable that the ancients regarded κώνειον as having the power of discussing tumors—a virtue which has been assigned to hemlock by writers of the present day.

I am fully aware that the characters of the ancient plant, as given us by Dioscorides and Pliny (*Hist. Nat.* lib. xxv. cap. 95, ed. Valp.), are insufficient to distinguish it from some other Umbelliferæ, yet I think the evidence of its being our Conium maculatum is deserving of much greater confidence than Dr. Christison is disposed to give it. The absence of all notice, in the writings of the ancients, of the purple spots on the stem, has been urged against the probability of this opinion. "Pliny's term *nigricans*, applied to the stem, is but a feeble approach," says Dr. Christison, "to the very remarkable character of the modern plant, the purple spotted stem." But in 1839 I showed to the pupils attending my lectures a stem of hemlock to which the term *blackish* might be applied, without greater impropriety of language than is daily made use of when a man is said to have a black eye; for the dark purple spots had coalesced so as to cover most completely the lower part of the stem. Admitting, however, that the term is not strictly correct, I would observe first, that there is no poisonous umbelliferous plant to which it applies so well as to hemlock, and, secondly, Dioscorides and Pliny may be well excused for using it, seeing that a distinguished living professor describes the spots on the stem as *blackish* (see Orfila's *Toxicol. Gén.* ii. 299, 1818).

It is evident that our generic term *Conium* is derived from the Greek word κώνειον. Linnæus has been censured by Lamarck for using this name, since the Latin authors call our hemlock *Cicuta*, which he, therefore, contends ought to be its designation now. But it ought to be remembered that Linnæus has only restored its ancient name, for the word Cicuta is unknown to the Greek language. By modern botanists the latter term is applied to a distinct genus of plants, and when, therefore, we meet with it in botanical works, we must not confound it with the cicuta of the Romans. Especially careful should the student be not to confound *Conium maculatum* with *Cicuta maculata*. It is certainly much to be regretted that such a ground of confusion should exist, but I am afraid it is now too late to obviate it.

BOTANY. *GEN. CHAR.*—Margin of the *calyx* obsolete. *Petals* obcordate, somewhat emarginate, with a very short inflexed lobe. *Fruit* compressed at the side, ovate. *Mericarps* [half-fruits] with five, prominent, undulated, crenulated, equal ridges, the lateral ones marginal. *Channels* with many striæ, but no vittæ. *Carpophorus* bifid at the apex. *Seed* incised with a deep narrow groove, and confounded with it.—European, biennial, poisonous *herbs*. *Root* fusiform. *Stem* round, branched. *Leaves* decompound. Both partial and general *involucres*, three to five leaved; partial one, halved. *Flowers* white, all fertile (D. C.)

SP. CHAR.—Leaflets of the partial *involucre* lanceolate. Partial *umbel* short (D. C)

Root biennial, tap-shaped, fusiform, whitish, from six to twelve inches long, somewhat resembling a young parsnip. *Stem* from 2 to 6 feet high, round, smooth, glaucous, shining, hollow, spotted with purple. *Leaves* tripinnate, with lanceolate, pinnatifid leaflets, of a dark and shining green colour, smooth, very fetid when bruised, with long, furrowed footstalks, sheathing at their base. *Umbels* of many general as well as partial rays. *General involucre* of several (usually three to seven) leaflets: *partial involucre* of three leaflets on one side. Margin of *calyx* obsolete. *Petals* five, white, obcordate, with inflexed points. *Stamina* five, epigynous, as long as the petals. *Ovarium* ovate, two-celled, striated; *styles* two, filiform, spreading; *stigma* round. *Fruit* ovate, compressed laterally; *mericarps* (half-fruits) with five primary, but no secondary, ridges, which are undulato-crenated; the channels have many striæ, but no vittæ. *Seed* with a deep, hollow groove in front.

HAB.—Indigenous; hedges and waste ground, especially near towns and villages. In other parts of Europe, the East of Asia, and in the cultivated parts of North America and Chili, into which it has been introduced.

In distinguishing Conium maculatum from other Umbelliferæ, the following characters should be attended to:—The large, round, smooth, spotted *stem*; the smooth, dark, and shining green colour of the lower *leaves*; the *general involucre* of from three to seven leaflets; the *partial involucre* of three leaflets; the *fruit* with undulated crenated primary ridges. To these must be added, that the whole *herb*, when bruised, has a disagreeable smell (compared by some to that of mice, by others to that of fresh cantharides or of cats' urine).

The indigenous Umbelliferæ most likely to be confounded with Conium maculatum, are, *Œthusa Cynapium* and *Anthriscus vulgaris*. *Œthusa Cynapium*, or *Fool's Parsley*, is distinguished from hemlock by its smaller *size*, by the absence of the strong disagreeable smell which distinguishes the *leaves* of hemlock, by the want of a *general involucre*, by the three long, narrow, unilateral, pendulous leaflets composing the *partial involucre*, by the *ridges* of the fruit being entire (*i. e.* not undulate or crenate), and by the presence of *vittæ*. *Anthriscus vulgaris*, or *Common Beaked-Parsley*, is known from hemlock by the paler colour and slight hairiness of the *leaves*, by the absence of spots on the *stem*, by the swelling under each joint, by the absence of a *general involucre*, by the roughness of the *fruit*, and by the absence of a strong unpleasant odour when the *leaves* are bruised.

DESCRIPTION.—The leaves (*folia conii*) only are officinal. They should be gathered from wild plants, just before the time, or at the commencement of flowering. If intended for drying, the larger stalks should be removed, and the foliaceous parts quickly dried in baskets, by the gentle heat (not exceeding 120° F.) of a proper stove. Exclusion from solar light contributes greatly to the preservation of the colour. If properly dried, the leaves should have a fine green colour, and their characteristic odour; and when rubbed with caustic potash should evolve the odour of conia. They should be preserved in cool, closed, perfectly opaque, and dry vessels. Tin canisters possess these properties. However, no reliance can be placed on the dried leaves, however carefully prepared, for they sometimes yield no conia, though they possess the proper hemlock-odour and a fine green colour. If the fresh leaves be subjected to pressure, they yield a greenish juice (*succus conii*) from which, on standing, a *green fecula* subsides. The fruit, commonly termed *hemlock seeds* (*fructus* seu *semina conii*), has very little odour, and a slight somewhat bitterish taste. It retains for a much longer time than the leaves its active principle unchanged (see *Conia*.)

Composition.—Schrader (*Berlin Jahrbuch*, 1805, S. 152) made a comparative analysis of wild and cultivated hemlock, but with no important result. He also made a comparative examination of hemlock and cabbage (*Brassica oleracea*), the only curious part of which was, that he found a striking resemblance between them (Schweigger's *Journ. für Chem.* Bd. v. S. 19, 1812). Peschier (Pfaff, *Syst. d. Mat. Med.* Bd. vii. S. 300: Berzelius, *Traité Chem.* vi. 254) found in hemlock a salt which he called *coniate of conia*, being composed of a peculiar crystallizable acid (*coniic acid*), and a peculiar base. Hemlock juice was analyzed by Bertrand (*Recueil de Mém. de Méd. de Chir. et de Pharm. Mil.* t. ix. p. 300); the leaves by Dr. Golding Bird (*London Med. Gaz.* xi. 248); the ashes by Brandes (*Berl. Jahrb.* 1819, S. 116). An analysis of hemlock (leaves?) by the last-mentioned chemist, is quoted by Merat and De Lens (*Dict. de Mat. Méd.* ii. 391). Peschier and Brandes first announced the existence, in this plant, of a peculiar basic principle, which Giseke (*Journ. de Pharm.* xiii. 366), in 1827, obtained in combination with sulphuric acid. But Geiger (*Mag. für Pharm.* xxxv. 75 & 259), in 1831, procured it, for the first time, in an isolated form, and described some of its properties and effects on animals. It was afterwards examined by Dr. Christison (*Trans. Roy. Soc. Edinb.* vol. xiii., and *Med. Gaz.* xviii. 123), and by MM. Boutran-Charlard and O. Henry (*Journ. de Chim. Méd.* t. ii. 2nde Ser. p. 530).

Schrader's Analyses.

	Hemlock.		Cabbage.
Extractive	2·73	—	2·34
Gummy extract	3·52	—	2·89
Resin	0·15	—	0·05
Vegetable albumen	0·31	—	0·29
Green fecula	0·80	—	0·63
Water, with acetic acid and various salts	92·49	—	93·80
Total	100·00	—	100·00

Brandes's Analyses.

Peculiar basic principle (*conicine*).
Very odorous oil.
Vegetable albumen.
Resins.
Colouring matter.
Salts.
[Lignin and water].
Hemlock.

1. *Volatile Oil of Hemlock.* (*Odorous principle.*)—The distilled water of hemlock possesses, in a high degree, the characteristic odour of hemlock, but is scarcely, if at all, poisonous. Hence it is obvious that the odorous matter is not the active principle. Furthermore it shows that the characteristic odour of hemlock, in the different preparations of this plant, is not to be taken as a necessary indication of their activity. Ber-

trand isolated the odorous matter, and found it to be a volatile oil of an acrid taste and peculiar odour.

2. *Conia* (*Conicine; Conein; Cicutine*).—Exists in hemlock in combination with an acid (*coniic acid*, Peschier); so that it cannot be recognized by its odour, nor obtained by distillation, without the assistance of an alkali. It exists, probably, in all parts of the plant, but is more copious in the fruit than in the leaves; and, most remarkably, it may be preserved for a much longer time in the former than in the latter. Geiger procured from six lbs. of fresh, and nine lbs. of dried fruits, about one ounce of conia, whereas from 100 lbs. of the fresh herb he obtained only a drachm of this alkaloid. He could get traces only of it in fresh dried leaves, while he extracted a drachm of it from nine ounces of the fruit which had been preserved (not very carefully) for sixteen years. From 40 lbs. of the ripe, but green, seeds (mericarps), Dr. Christison obtained two ozs. and a half of hydrated conia. Conia, free from all impurity but water, may be obtained by distilling the alcoholic soft or syrupy extract of the seeds (mericarps) with its own weight of water and a little caustic potash. The conia passes over readily, and floats on the surface of the water (which contains conia in solution). When pure, conia is an oily-looking transparent liquid, lighter than water. Its odour is strong and penetrating, somewhat like that of hemlock, or more analogous to a combination of the odours of tobacco and mice. Its taste is acrid; it is sparingly soluble in water, but is entirely soluble in alcohol and ether. It reddens turmeric, and neutralizes the dilute acids, forming salts. While saturating, the liquors have a bluish-green tint, which subsequently passes to a reddish-brown. It combines with about a fourth of its weight of water to form a *hydrate of conia*. When placed in a vacuum, in the presence of bodies very attractive of water, it in part volatilizes, and leaves a reddish, very acrid, pitchy residue, which appears to be anhydrous [partially decomposed?] conia. The vapour of conia is inflammable. By exposure to the air it acquires a dark colour, and is resolved into a brown resin and ammonia. Its boiling point is 370° F., but it readily distils with water at 212° F.

Conia is characterized by its liquidity at ordinary temperatures, its volatility, its peculiar odour, its reddening turmeric paper, its vapour forming white fumes (*hydrochlorate of conia*) with the vapour of hydrochloric acid, its solution in water, forming, with infusion of nutgalls, a white precipitate (*tannate of conia*), its sulphate and other salts being deliquescent and soluble in alcohol, its not being reddened by either nitric or iodic acids, and, lastly, by its alcoholic solution not being precipitated by the alcoholic solution of carbazotic acid. Several of the *salts of conia* are crystallizable. When solutions of the salts are evaporated they lose a part of their base, the odour of which becomes sensible. The nitrate of conia, when decomposed by heat, yields brown pyrogenous products. Potash added to a salt of conia sets the base free, which is then recognized by its odour.

Liebig analyzed conia. Its constituents are:—

	Atoms.	*Eq. Wt.*	*Per Cent.*	*Liebig.*
Carbon	12	72	66·67	66·913
Hydrogen	14	14	12·96	12·000
Nitrogen	1	14	12·96	12·805
Oxygen	1	8	7·41	8·282
Conia	1	108	100·00	100·000

The *effects* of conia have been tried on mammals (the dog, cat, rabbit, and mouse); birds (pigeon, kite, and sparrow): reptiles (slow-worm), amphibials (the frog), annelides (earth-worm), and insects (fly and flea). One drop placed in the eye of a rabbit killed it in nine minutes; three drops employed in the same way killed a strong cat in a minute and a half; five drops poured into the throat of a small dog began to act in thirty seconds, and in as many more motion and respiration had entirely ceased.

The following are the symptoms produced, as detailed by Dr. Christison. "It is, in the first place, a local irritant. It has an acrid taste; when dropped into the eye, or on the peritoneum, it causes redness or vascularity; and to whatever texture or part it is applied, expressions of pain are immediately excited. But these local effects are soon overwhelmed by the indirect or remote action which speedily follows. This consists essentially of swiftly-spreading palsy of the muscles,—affecting first those of voluntary motion, then the respiratory muscles of the chest and abdomen, lastly the diaphragm, and thus ending in death by asphyxia." Convulsive tremors, and twitches of the limbs, sometimes, though not invariably, are observed. The external senses do not appear to be affected until respiration is impaired. If a rabbit be lifted up by his ears when under the influence of the poison, he makes the same kind of struggles to be released that he does when in health. So also if we place him in an uneasy posture, he makes attempts to alter his position, proving that his senses are unimpaired. After death the muscles are susceptible of the galvanic influence. MM. Boutran-Charlard and O. Henry state, that most of the animals to whom they gave conia became "a prey to the most dreadful convulsions. The plaintive cries, the contortions, and the rigidity of the limbs, which have always preceded death, leave no doubt as to the cruel pains which this kind of poisoning brings on." This account agrees neither with my own observations, nor with those published by Dr. Christison.

Does conia become absorbed? In favour of the affirmative view of this question may be mentioned the fact, that this alkali acts on all the textures admitting of absorption; and that the quickness with which the effects occur, are in proportion to the absorbing power of the part. But the rapidity of its action, when introduced into the veins, is a barrier to the supposition of its acting on the nervous centres by local contact; for Dr. Christison states, that two drops, neutralized by dilute muriatic acid, and injected into the femoral vein of a young dog, killed the animal in two or three seconds at farthest.

The primary seat of the action of conia is probably the spinal cord. In this conia and strychnia agree; but in the nature of the effect, they seem, as Dr. Christison has observed, to be the counterparts of each other. Conia exhausts the nervous energy of the cord, and causes muscular paralysis; strychnia irritates it, and produces permanent spasm of the muscles. Both kill by bringing on asphyxia, the first by the paralysis, the second by the spasm, of the respiratory muscles. It is evident, therefore, that, like strychnia and nux vomica (see p. 913), its operation is on the seat of the reflex functions, which, according to Mr. Grainger (*Obs. on the Struct. and Funct. of the Sp. Card*), is the gray matter of the spinal cord.

These effects of conia suggest its employment in convulsive or spasmodic diseases; as tetanus, poisoning by strychnia, brucia, or nux vomica, hydrophobia, &c. I have tried it on a rabbit under the influence of strychnia, and found that it stopped the convulsions, but hastened rather than prevented death. In September, 1838, it was tried in a case of hydrophobia at the London Hospital. The following is a brief report of the case:—"In the case of hydrophobia, in a man middle-aged, after the disease was fully formed, two minims of conia, dissolved in thirty drops of acetic acid, were applied endermically to the præcordium (the cuticle being previously removed by a blister). The effects were instantaneous. The pulse fell from 64 to 46, and became more regular. The vomiting and convulsions ceased; the respiration became less difficult, and the symptoms of the disease appeared to be altogether mitigated. The man expressed himself as feeling much better, and entertaining hopes of an ultimate recovery. These effects were, however, but transitory, and in about seven minutes the symptoms began to reappear, and shortly assumed their previous urgency. Three minims of conia were injected into the rectum, about a quarter of an hour after the endermic application of it, but it produced no effect in allaying the symptoms of the disease. The remedy was not repeated, and the man became rapidly worse, and died in a few hours."

3. *Empyreumatic Oil of Hemlock* (*Pyro-conia?*).—This oil, obtained by the destructive distillation of hemlock, resembles, according to Dr. Morries (*Ed. Med. and Surg. Journ.* xxxix. 377), that procured from foxglove (see p. 838).

Characteristics for Medico-legal purposes.—Hemlock can only be properly recognized by its botanical characters, already described: yet its remarkable odour may sometimes be of considerable assistance in recognizing the plant or its preparations; nor is the fact to be lost sight of, that potash develops a strong smell of conia. In some cases it might be possible to obtain some conia by distilling the alcoholic extract of the suspected substance with water and caustic potash.

Physiological Effects. (*a.*) *On vegetables.*—Marcet placed a haricot plant (*Phaseolus vulgaris*) in a solution of five grains of the extract of hemlock. In a few minutes the two lower leaves curled at their extremities; the next day they were yellow, and subsequently died (*Ann. Chim. et Phys.* xxix. 219). Schübler and Zeller (Schweigger's *Journ. f. d. Chem.* Bd. l. S. 54) also confirm its poisonous operation.

(*b.*) *On animals generally.*—The effects of hemlock on animals have been tried by Harder (Boneti, *Sepulchr.* l. iv. sect. x. Obs. iv. p. 488), Wepfer (*Hist. Cicut. aquat.* p. 201, 1733), Orfila (*Toxicol. Gén.* ii.), and Schubarth (Wibmer, *Wirk. d. Arzneim. ü. Gifte.* ii. 169). The animals experimented on were the dog, wolf, rabbit, and guinea-pig. The action of hemlock on the solipedes and ruminants is very much less energetic than on the carnivora. Moiroud (*Pharm. Vét.* 359) has given three lbs. and a half of the plant to a young horse, without inconvenience; but in another case a decoction of four ounces of the dried plant proved fatal. It caused dejection, stupor, dilatation of the pupils, trembling, salivation, nausea, spasmodic contraction of the muscles of the extremities, rolling of the eye, grinding of the teeth, and copious cold sweats. From the observations of Orfila, hemlock is a local irritant (though this action was not constantly observed), and produces giddiness, convulsions, loss of sensibility, palsy, and coma. This account, as Dr. Christison observes, does not agree with the symptoms induced by conia, which does not seem to affect the senses so long as the respiration goes on. "But it is possible," he adds, "that the difference is more apparent than real, and that hemlock has been supposed to extinguish sensation, merely because by inducing paralysis it takes away the power of expression; at least in some experiments I have made, sensation did not appear to be affected; and the whole phenomena were identical with those produced by conia. In these experiments I used very strong extracts, prepared by absolute alcohol from the fresh leaves or the full-grown seeds; and each of them occasioned, in doses of thirty grains or thereabouts, paralysis of the voluntary muscles, with occasional slight convulsions, then paralysis of the respiratory muscles of the chest and abdomen, and finally cessation of the action of the diaphragm. Sensation appeared to continue so long as it was practicable to make an observation on the subject; and the heart contracted vigorously for a long time after death." But from the united observations of the effects of hemlock on animals and man, I cannot help suspecting, either that this plant contains a second active principle, whose operation is somewhat distinct from conia, or that the influence of this alkaloid is greatly modified in the plant by combination with other matters.

(*c.*) *On man.*—In *small* or *medicinal* doses, hemlock has been frequently administered for a considerable period, with obvious relief, in certain diseases (tumours of various kinds, for example), without any other evident effect: hence the statement of some authors, that hemlock acts insensibly on the system. "It seldom purges," says Storck (*Essay on Hemlock*, Eng. Tr. 2d ed. 1762), "and very rarely vomits. Sometimes it increases perspiration, and often it occasions a copious discharge of viscid urine. In many patients, nevertheless, it does not sensibly augment any of the secretions." Long-continued use, especially if the doses be increased, will sometimes occasion disorder of the digestive organs or of the nervous system, dryness of the throat, thirst, and occasionally, it is said, an eruption on the skin. Choquet (Orfila, *Toxic. Gén.* ii.) mentions the case of a man who gradually increased the dose of the extract to half a drachm: it produced slight delirium and syncopes, which obliged him to suspend its use.

The ancients were of opinion that hemlock exercised a specific influence over the breasts and testicles. "It extinguishes the milk," says

Dioscorides, "and prevents the developement of the mammæ of virgins: moreover, in boys it causes wasting of the testicles." Pliny gives a similar account of it, and adds, "it reduces all tumors." The same notions of its effects seem to have been entertained by the Arabians; for Avicenna praises it as a remedy for tumours of the breasts and testicles. More recently (*Lond. Med. Gaz.* viii. 125), somewhat similar effects on the breasts have been ascribed to it. In two cases it is said to have stopped the secretion of milk, and to have caused atrophy of the mammæ.

In *large* or *poisonous doses* the symptoms are those indicating disorder of the cerebro-spinal functions. In some of the best-recorded cases the leading symptom was coma; the effects being altogether analogous to those of opium. In other instances, convulsions, or violent delirium, or both, were the prominent symptoms. As an illustration of the *comatose condition*, sometimes brought on by this poison, I shall quote a case recorded by M. Haaf, a French army surgeon, and which occurred to him while in garrison at Torrequemada, in Spain, in March, 1812 (Orfila, *Toxicol. Gén.*)

A soldier having eaten of some broth, into which hemlock had been put, went to sleep immediately after his supper. In an hour and a half he was found groaning and breathing with difficulty; in consequence of which M. Haaf was sent for. He found his patient in a profound sleep, without sense, respiring with extreme difficulty, and lying on the ground. His pulse was 30, small, and hard; the extremities cold; the face bluish, and distended with blood, like that of a person strangled. Twelve grains of emetic tartar were given, and occasioned some fruitless attempts to vomit. He became gradually worse, had violent palpitations of the heart, and died in three hours after his fatal supper.

Several other cases in which coma was the leading symptom might be quoted, but the one just related is the best.

We have no well-detailed cases in which *delirium* was the leading symptom. The following must suffice, by way of illustration; it is from Kircher (Wibmer, *Wirk.* &c. ii. 172):—Two priests ate hemlock root by mistake; they became raving mad, and mistaking themselves for geese, plunged into the water. For three years they suffered with partial palsy and violent pain. Orfila also mentions a vine-dresser and his wife, who became mad and furious from hemlock.

As illustrations of the *convulsions* caused by hemlock, I may refer to the cases mentioned by Limprecht and Ehrhard (Wibmer, *op. cit.*) The first states that an old woman suffered for three months with abdominal pain and convulsive movements of the limbs, in consequence of eating hemlock root. Ehrhard mentions trismus as one of the symptoms in another case. Dr. Watson (*Phil. Trans.* Vol. xliii. No. 473, p. 18) has related two cases in which giddiness, coma, and convulsions occurred.

These statements, as well as others of a like tendency which might be quoted, do not agree with the (as yet ascertained) effects of conia. The *post-mortem* appearances throw but little light on the *modus operandi* of hemlock. Venous congestion, especially of the cerebral vessels, a fluid condition of the blood, and, in the lower animals, redness of the alimentary canal, are the occasional appearances.

Uses.—In the present state of uncertainty with respect to the real physiological operation of hemlock, it is obviously impossible to lay down indications or contra-indications for its use which can be much relied on. Acute inflammation, fever, apoplexy, or a tendency to it, and paralysis, are among the circumstances which oppose the employment of hemlock.

The uses of hemlock may be reduced to two heads: those which depend on its influence over the organic functions; and, secondly, those which have reference to its influence over the cerebro-spinal system. The resolvent or discutient and alterative uses come under the first head; the antispasmodic and anodyne under the second.

1. *As a resolvent or discutient and alterative.*—Under the continued use of small and repeated doses of hemlock, glandular and visceral enlargements have frequently subsided: hence has arisen the opinion, entertained in all ages, of the resolvent and discutient powers of this remedy, and of the stimulus which it communicates to the absorbing vessels. The mammæ and the skin are the parts in which these powers have been supposed to be more especially manifested; and the asserted effects (wasting of the breast, profuse sweating, and eruptions) of hemlock on these parts, in healthy individuals, lend support to this opinion. But the influence of hemlock over the organic functions does not appear to be limited to this resolvent operation. In foul ulcers the quality of the discharge has been greatly improved, while pain has been alleviated, and the tendency of the sores to spread has apparently been greatly diminished. If, then, these effects be really referrible to hemlock (and they have been asserted by so many writers in all ages, that we can scarcely refuse to admit them), they prove that this plant exercises a most profound influence over nutrition and the other organic functions, and which we have no better term to indicate than that of alterative. But so frequently has this influence failed to manifest itself, especially in those cases where it was most desired, that a very proper doubt has prevailed among practitioners of the present day, whether it really exists, and whether those phenomena which have been supposed to indicate it, are not really referrible to other influences and circumstances. That hemlock has some influence of the kind referred to, I confess I do not doubt; but it has been greatly exaggerated, and thereby much unmerited discredit has been brought on the remedy: for practitioners, finding that it would not do all that had been ascribed to it, have frequently dismissed it as altogether useless. Whether the failures ought, in part at least, to be ascribed to imperfect modes of preparing and administering this plant, we are, as yet, unable positively to affirm. One fact, however, is certain, that many of the preparations of hemlock in ordinary use are inert, or nearly so; and others, probably, have had their properties greatly changed in the process of their preparation. The remark made by Dr. Christison, with respect to the physiological effects of this plant, applies well to the point under discussion. "If," says this writer, "physicians or physiologists would acquire definite information as to the physiological effects of hemlock, in small or medicinal doses, they must begin the inquiry anew. Little importance can be attached to any thing already done in this field, as I have no doubt whatever, that by far the greater proportion of the preparations of hemlock hitherto employed have been of very little energy, and, in the doses commonly used, are absolutely inert."

The diseases to which the preceding remarks especially apply, are, *enlargements and indurations of the absorbing and secreting glands*, and *of the viscera, scrofula, obstinate chronic skin diseases*, and *foul ulcers*. I am not prepared to offer any opinion, as to whether the diseases to which the terms *scirrhus* and *cancer* are strictly applicable, have ever been cured by hemlock. One fact is undoubted, that diseases, supposed to have been scirrhous and cancerous, have been greatly alleviated, and, in some cases, apparently cured by this remedy. This fact does not rest on the sole testimony of Storck (*Essay on the Med. Nat. of Hemlock* [Eng. Transl.], 2d ed. 1762), but on that of a multitude of practitioners (see Bayle, *Bibl. Thérap.* iii. 618). Bayle has collected, from various writers, forty-six cases of cancerous diseases, said to have been cured, and twenty-eight ameliorated by hemlock. In *scrofula*, in which disease Fothergill (*Med. Obs. & Inq.* iii. 400), and many others (see Bayle, *op. cit.*), have praised it, it seems to be occasionally useful as a palliative in irritable constitutions. It allays the pain, and assists in reducing the volume of enlarged lymphatic glands, and in scrofulous ulcerations improves the quality of the discharge, and disposes the sores to heal. Even *enlargements of the liver, spleen*, and *pancreas*, have been, at times, apparently, benefited by hemlock. In *mammary tumors* and *profuse secretion of milk* (*galactorrhœa*), a trial of it should never be omitted. In *bronchocele* it has been found efficacious by Dr. Gibson, Professor of Surgery in the University of Pennsylvania (*United States Dispensatory*). In *syphilis* it is useful, by alleviating nocturnal pains, and in diminishing the tendency to spread of irritable sores (Pearson, *Obs. on the Effects of Var. Art. of the Mat. Med. in Lues Venerea*, p. 62, 1800). In *chronic skin diseases* (lepra, herpes, &c.) it is now but rarely employed.

2. *As a cerebro-spinal agent* (*antispasmodic and anodyne*).—The power possessed by conia of paralyzing the motor nerves, suggests the employment of hemlock as an *antispasmodic*. Hitherto, however, trials of it have been made in a few spasmodic diseases only, and those have not proved favourable to its reputation. In some spasmodic affections of the respiratory organs it has gained a temporary celebrity only. In *hooping-cough*, Dr. Butter (*Treat. on the Kink-cough*, 1773) spoke favourably of it, as having the advantage over opium of not being liable to check expectoration. But though the violent and periodic fits of coughing are obviously of a spasmodic nature, and, therefore, apparently adapted for the use of hemlock, experience has fully proved that the disease is one which will run through a certain course. At the best, therefore, hemlock can prove a palliative only. In other forms of *spasmodic cough*, as well as in *spasmodic asthma*, hemlock deserves farther trial. In *tetanus*, conia or hemlock held out some hopes (fallacious, I am afraid) of doing good. Mr. Curling has kindly furnished me with the notes of a case which occurred in the London Hospital. A tincture of hemlock seeds was exhibited on the eighth day of the disease, at first in doses of ♏xx. every hour, which were increased in the course of the three following days to f℥ij. every quarter of an hour, until the patient (a man aged 46) had taken, in all, two pints! but without any decided effect on the spasms or brain. Morphia and laudanum were afterwards used, but the man died. A small quantity of conia, obtained from three ounces of the same tincture used in this case, killed a cat in less than four minutes. In a case of *chorea*, treated by Mr. Curling, no relief was obtained by the use of the above-mentioned tincture, given to the extent of three ounces in twelve hours. The patient (a young man) ultimately died, exhausted

from the long-continued and violent convulsions of nearly all the voluntary muscles.

Hemlock has been frequently employed as an *anodyne*, and often with apparent relief. As, however, conia does not appear to have the same paralyzing influence over the sensitive, that it has over the motor, nerves, some doubt has been raised on the real anodyne influence of hemlock. However, *in tender glandular enlargements*, *in painful ulcers*, *in scirrhus* and *cancer*, *in rheumatism*, and *in neuralgia*, hemlock has, at times, evidently mitigated pain; and its power of *allaying troublesome cough*, is, in some instances, referrible to its diminishing the preternatural sensibility of the bronchial membrane.

Anaphrodisiac properties have been ascribed to hemlock, and hence this remedy has been used in nymphomania and satyriasis.

Administration.—Hemlock is used in the form of *powder*, *tincture*, *extract*, *ointment*, and *poultice*.

1. *Pulvis Conii.*—The powder, when properly prepared from the leaves, has the peculiar odour of the plant, and a fine green colour: but neither the odour nor the colour are absolutely indicative of activity. The test of the presence of conia is caustic potash, and, as the *Edinburgh College* properly observes, "the powder triturated with aqua potassæ, exhales a powerful odour of conia." But the odour of the volatile oil of the plant being very analogous to that of conia, creates some difficulty with experienced persons. The vapour of conia, evolved from powdered hemlock by potash, fumes with hydrochloric acid; but the same occurs with ammonia, set free by the same agent. As the powder, however well prepared, quickly spoils by keeping, it is not a preparation which deserves confidence, and should never be used if it have been kept beyond the year. The dose of it is three or four grains twice or thrice daily, the quantity being gradually increased until some obvious effect (nausea, dryness of the throat, giddiness, headache, or disordered vision) in the system is produced. As different parcels of the powder possess very unequal powers, it is necessary, when changing the parcels, to recommence with small doses. I have already (p. 1063) referred to the observation of Geiger as to the small quantity, or even entire absence, of conia, in the dried leaves of hemlock.

2. *Tinctura Conii*, L. E. D. (Hemlock leaves, dried, ℥v. [℥ij. *D.*]; Cardamom seeds, bruised, ℥j.; Proof Spirit, Oij. [Oj. *D.*] Macerate for fourteen [seven *D.*] days, and strain. This formula of the *Edinburgh College* is as follows: "Fresh leaves of Conium, ℥xij.; Tincture of Cardamom, f℥x.; Rectified Spirit, Oj. and f℥vj. Bruise the hemlock leaves, and express the juice strongly; bruise the residuum, pack it firmly in a percolator; transmit first the tincture of cardamom, and then the rectified spirit, allowing the spirituous liquors to mix with the expressed juice as they pass through; add gently water enough to the percolator for pushing through the spirit remaining in the residuum. Filter the liquor after agitation.")—The process of the Edinburgh College yields a much more energetic preparation than that of the London and Dublin Colleges, as it obviates the necessity of drying the leaves, and, therefore, much deserves the preference. If, however, the percolation were dispensed with, and the tincture prepared merely by adding spirit (not tincture of cardamom) to the expressed juice, the process would be greatly improved. If the leaves have been sufficiently pressed, the

percolation is scarcely necessary, and, therefore, only adds to the labour and expense of the process. Any active matter lost by omitting percolation, may be easily compensated for, by increasing the quantity of juice employed, the cost of which scarcely deserves notice. The employment of tincture of cardamom is objectionable, since it prevents the apothecary from forming a judgment of the colour, taste, and smell of, and the effect of potash on, this preparation. And lastly, if the percolation process be adopted, surely the directions of the Edinburgh College are too loose. The quantity of water which is to be employed "for pushing through the spirit" should be accurately defined, or it will be impossible to have preparations made at different times, and by different persons, of uniform strength. Good tincture of hemlock should evolve a strong odour of conia on the addition of potash. An excellent tincture of hemlock, prepared by adding rectified spirit to the expressed juice, has been shewn me by Mr. Bentley, Chemist, of Moorgate Street. In 1837 (*Lond. Med. Gaz.* xix. 770) I recommended the use of an *alcoholic tincture of the bruised fruit.* More recently, Dr. Osborne (*Dub. Journ.* xvj. 469) has advised the same.

Tinctura conii, L. D. is given in doses of fʒss. or fʒj. which are to be gradually increased until some effect is produced. *Tinctura conii.* E. must be employed more cautiously; though the quantity of hemlock leaves used by the Edinburgh College would, if dried, be scarcely half that employed by the London and Dublin Colleges (as 1000 parts of the fresh leaves yield only 185 parts when dried, according to Henry and Guibourt, *Pharm. Raison.* i. 27). The drying, however, as I have already noticed, greatly deteriorates the activity of the leaves.

3. *Extractum Conii*, L. E. *Succus inspissatus Conii*, D. (Fresh hemlock leaves, lb. j.; bruise them, sprinkled with a little water, in a stone mortar; then press out the juice, and evaporate it, unstrained, to a proper consistence, *L.* The *Dublin College* directs it to be prepared as the inspissated juice of Aconite. The following are the directions of the *Edinburgh College:* "Take of Conium any convenient quantity, beat it in a uniform pulp in a marble mortar, express the juice, and filter it. Let this juice be evaporated to the consistence of a very firm extract, either in a vacuum with the aid of heat, or spontaneously in shallow vessels exposed to a strong current of air freed of dust by gauze skreens. This extract is of good quality only when a very strong odour of conia is disengaged by degrees, on its being carefully triturated with aqua potassæ.")—Most of the extract of the shops is inert, or nearly so. "We were one day," says Orfila (*Toxicol. Gén.* ii.) "in the shop of an apothecary, who had several times furnished us with the extract of hemlock, which we had administered to dogs to the dose of ten drachms, without producing any serious accident. We endeavoured to prove to him that the medicine was badly prepared; and, in order to convince him effectually, we swallowed, in the presence of several persons who happened to be in his shop, a drachm of this extract (seventy-two grains) dissolved in two drachms of water. We felt no effect from it, whilst twenty or thirty grains of the extract, well prepared, would have probably proved fatal to us. Let it be conceived now what advantage a person is likely to derive from such an extract, who takes one or two grains of it per day, or even thirty or forty, with the hope of getting rid of a scirrhous tumour, or of any other disease."

The extract of hemlock contains very little conia; this has been shewn by Geiger and by Christison, and has been verified by myself. From ℥iv. of extract, procured from one of the most respectable drug houses in town, I was unable to procure any sensible quantity of this alkali. "From what has come under my own observation," says Dr. Christison, "the extracts of hemlock may become feeble, if not even inert, in one or two ways,—either by the heat being continued after the concentration has been carried to a certain extent, or by long keeping. On the one hand, I have always observed, that from the point at which the extract attains the consistence of this syrup, ammonia begins to be given off in abundance, together with a modified odour of conia. And, on the other hand, I have found extracts, which were unquestionably well prepared at first, entirely destitute of conia in a few years,—a remark which applies even to the superior extract prepared by Mr. Barry, of London, by evaporation *in vacuo*."

Mr. Brande (*Dict. of Pharm.* 195) observes that "the most active extract is that which is procured by moderate pressure from the leaves only; when the stalks and stems are used, and violent pressure employed, the extract is glutinous, dark-coloured, and viscid, and less active than in the former case, when it has a somewhat mealy consistency, and an olive-green colour. With every caution, however, on the part of the operator, the colour, odour, and efficacy of extract of hemlock, will vary with the season, and with the situation and soil in which the herb has grown. The best method of preparing this and similar extracts, consists in gradually heating the expressed juice to a temperature of about 212° [by which the vegetable albumen coagulates, and retains, mechanically or chemically, a portion of the active principle], then to suffer it to cool, to strain it through moderately fine linen, and evaporate the strained liquor, and when it has nearly acquired a proper consistency, to add the matter which remained upon the strainer." One *cwt.* of hemlock yields from three to five lbs. of extract. If ammonia be evolved during the preparation of the extract, we may infer that decomposition of the conia is going on. However carefully extract of hemlock may be prepared, I prefer for medicinal use the tincture made with the expressed juice as before stated. The dose of the extract should, at the commencement, be two or three grains, and gradually increased until some obvious effect is observed.

4. *Pilulæ Conii Compositæ*, L. (Extract of Hemlock, ʒv.; Ipecacuanha, powdered, ʒj.; Mixture of Acacia, as much as may be sufficient. Beat them together until incorporated.)—Antispasmodic, slightly narcotic, and expectorant. Used in spasmodic coughs, bronchitis, the incipient stage of phthisis, &c. Dose, gr. v. to grs. x. twice or thrice daily.

5. *Unguentum Conii*, D. (Fresh leaves of Hemlock, Prepared Hogs' Lard, of each lbs. ij.; boil the leaves in the lard until they become crisp, then express through linen.)—It is employed as an anodyne application to foul, painful, and cancerous sores, to glandular and scirrhous swellings, and to painful piles. An extemporaneous substitute may be prepared with lard and the extract of hemlock.

6. *Cataplasma Conii*, L. D. (Extract of Hemlock, ℥ij.; Water. Oj. Mix, and add Linseed, bruised, as much as may be sufficient to make it of a proper consistence, *L.* The formula of the *Dublin College* is as follows: Leaves of Hemlock, dried, ℥j.; Water, Oiss. Boil down to a

pint, and having strained the liquor, add as much of the same kind of powder as is sufficient to form a cataplasm.)—*A poultice of hemlock* is sometimes employed as a soothing anodyne application to cancerous, scrofulous, venereal, and other foul ulcers. It is sometimes prepared with the unstrained decoction and bruised meal; occasionally the bruised leaves, or the dried herb with hot water, is used. *Hemlock fomentations* (*fotus conii*) is sometimes applied to painful swellings. It is prepared with the herb (fresh when it can be procured) and hot water.

ANTIDOTES.—No chemical antidote is known for hemlock, though it is not improbable that an infusion of galls might be serviceable, as mentioned for *conia.* The first object, therefore, is to evacuate the poison from the stomach; this is to be effected by the same means as directed for poisoning by opium. If the poison be suspected to have passed into the bowels, a purgative is to be administered, unless diarrhœa have come on. The subsequent treatment will depend on the symptoms: blood-letting is frequently required, to relieve the congested state of the cerebral vessels. Opium is generally prejudicial. Artificial respiration should not be omitted in extreme cases. As strychnia and nux-vomica appear to produce a condition of the spinal cord opposite to that of conia, would either of these agents be serviceable?

Corian'drum sati'vum, Linn. L. E. D.—*The Officinal Coriander.*

Sex. Syst. Pentandria, Digynia.

(Fructus, *L.*—Fruit, *E.*—Semina, *D.*)

HISTORY.—Coriander is mentioned by Moses (*Exod.* xvi. 31). It was used by Hippocrates (*Opera*, 359, 529, &c. ed. Fæs.); Dioscorides (lib. iii. cap. 71); and Pliny (*Hist. Nat.* lib. xx. cap. 82, ed. Valp.) also mentions it. The Greeks called it κόριον or κορίαννον.

BOTANY. *GEN. CHAR.*—Teeth of the *calyx* five, acute, unequal, persistent. *Petals* obvate, emarginate, with an inflexed lobe, the exterior radiating, bifid. *Fruit* globose, ten-ribbed, scarcely separating. *Mericarps* [half-fruits] with five primary, depressed, wavy ridges, and no secondary ones [besides the marginals] more prominent and keeled. *Channels* evittate. *Commissure* bivittate. *Carpopodium* in the middle face, semi-bifid, adnate at the base and apex. *Seed* excavated in the front, covered with a loose membrane.—Smooth *herbs.* *Stem* round. *Leaves* (upper ones at least) manycleft. *Umbel* with three to five rays. *Involucre* none. *Involucella* about three-leaved, halved. *Flower-buds* sometimes roseate. *Flowers* white. *Stylopodium* conical (D. C.)

SP. CHAR.—The only species.

Root tapering. *Stem* erect, twelve to eighteen inches high. *Leaves* scarcely stalked, all bipinnate and cut; the *leaflets* of some of the lowermost, wedge-shaped, or fan-shaped; acute notched; of the rest, in fine linear segments. *Flowers* white, often with a reddish tint.

HAB.—Grows wild about Ipswich and some parts of Essex, but is not really indigenous. Native of the south of Europe. Cultivated in Essex.

DESCRIPTION.—The fruit, commonly termed *coriander seeds* (*fructus* seu *semina coriandri*), is globular, about the size of white pepper, of a greyish-yellow colour, and is finely ribbed. It consists of two hemispherical mericarps, adherent by their concave surfaces. Each mericarp has five primary ridges, which are depressed and wavy; and four secondary ridges, more prominent and carinate. The channels are without vittæ, but the commissure has two. The odour of coriander is peculiar and aromatic.

COMPOSITION.—The odour, taste, and medicinal qualities of the fruit depend on volatile oil.

Volatile Oil of Coriander (*Oleum Coriandri*).—Yellowish; smells strongly and pretty agreeably of the coriander.

PHYSIOLOGICAL EFFECTS.—Aromatic stimulant, like the other carminative umbelliferous fruits (p. 72).

USES.—Dr. Cullen considered coriander as more powerfully correcting the odour and taste of senna than any other aromatic; and hence it was formerly a constituent of the compound infusion of senna, though now ginger is substituted for it. It is only employed in medicine as an adjuvant or corrigent. It is used, however, by the confectioners and distillers. It is a constituent of the *confectio sennæ*. The dose of coriander is ʒss. to ʒj.

Other Umbelliferæ, Dietetical or Poisonous.

All the important medicinal Umbelliferæ have been noticed. It remains now to enumerate those plants in common use for dietetical purposes, or which are indigenous and poisonous.

Of the *Dietetical Umbelliferæ* several have been already mentioned. To these may be added Parsley (*Petroseli'num sati'vum*) and Chervil (*Anthris'cus Cerefo'lium*), used as pot-herbs and garnishings; the Parsnip (*Pastina'ca sati'va*) and Skirret (*Si'um Sis'arum*), employed on account of their esculent roots; Celery (*A'pium grave'olens*), an acetarious plant, the blanched leaf-stalks of which are eaten raw as a salad; Common Samphire (*Crith'mum marit'imum*), which is pickled; Eryngo (*Eryn'gium campes'tre*), the root of which is preserved, and eaten as a candy (*Candied Eryngo; Radix Eryngii condita*); and Lovage (*Levis'ticum officina'le*), used by distillers for preparing a liqueur termed *lovage*.

The *Poisonous Indigenous Umbelliferæ* are acro-narcotics. When swallowed they cause gastric irritation, giddiness, delirium, convulsions, and coma. The most important (after Conium maculatum, before mentioned), are Fool's Parsley (*Æthu'sa Cyna'pium*), which contains a peculiar alkaloid called *cynapina;* Hemlock Water-dropwort (*Œnan'the croca'ta*); Celery-leaved Water-dropwort (*Œnan'the apiifo'lia*), and Water Hemlock (*Cicu'ta viro'sa*).

ORDER 53. CUCURBITA'CEÆ, *Jussieu.*—THE GOURD TRIBE.

ESSENTIAL CHARACTER.—*Flowers* usually unisexual, sometimes hermaphrodite. *Calyx* five-toothed, sometimes obsolete. *Corolla* five-parted, scarcely distinguishable from the calyx, very cellular, with strongly-marked reticulated veins, sometimes fringed. *Stamens* five, either distinct or cohering in three parcels; *anthers* two-celled, very long and sinuous. *Ovary* inferior one-celled, with three parietal placentæ; *style* short; *stigmas* very thick, velvety or fringed. *Fruit* fleshy, more or less succulent [occasionally dry, opening by valves], crowned by the scar of the calyx, one-celled [in some Momordicas three- or four-celled], with three parietal placentæ. *Seeds* flat, ovate, enveloped in an aril, which is either juicy, or dry and membranous; *testa* coriaceous, often thick at the margin; *embryo* flat, with no *albumen; cotyledons* foliaceous, veined; *radicle* next the hilum.—*Roots* annual or perennial, fibrous or tuberous. *Stem* succulent, climbing by means of tendrils formed by abortive leaves (stipules, *St. Hil.*) *Leaves* palmated, or with palmate ribs, very succulent, covered with numerous asperities. *Flowers* white, red, or yellow (Lindley).

PROPERTIES.—Variable; suspicious. The roots and fruits of many species are drastic cathartics. The fruits of other species are employed as articles of food.

Cu'cumis Colocyn'this, Linn. L. E. D.—*The Bitter Cucumber, or Colocynth.*

Sex. Syst. Monœcia, Syngenesia* (*Linn.*)

(Peponum Pulpa Exsiccata, *L.*—Pulp of the Fruit, *E.*—Fructus pulpa, *D.*)

HISTORY.—Colocynth is supposed to be the plant termed, in the Old Testament (2 *Kings*, iv. 39), the *wild vine* (literally *the vine of the field*), whose fruit the Sacred historian calls *pakkoth*, a word which in our translation is rendered *wild gourd.* To understand the passage referred to, it is to be remembered that different kinds of gourd are commonly used in the East for shredding into pottages (*Picture Bible*, ii. 226). Colocynth was employed by the Greeks at a very early period. Hippocrates (263 & 265, ed. Fœs.) employed κολοκυνθὶς ἄγρια (*cucurbita sylvestris*, or *wild gourd*) only in pessaries for bringing on menstruation. Dioscorides (lib. iv. cap. 178) gives a good description of colocynth. Pliny (*Hist. Nat.* xx. 8, ed. Valp.) calls it *colocynthis*.

BOTANY. *GEN. CHAR.*—*Calyx* tubular-campanulate, with subulate segments scarcely the length of the tube. *Petals* scarcely adherent to each other and to the calyx. *Males: stamina* five, triadelphous. *Females: stigmas* three, thick, bipartite. *Fruit (peponida)* three- to six-celled. *Seeds* ovate, compressed, not marginate.—*Flowers* monœcious or hermaphrodite, yellow (D. C.)

SP. CHAR.—*Stem* procumbent, somewhat hispid. *Leaves* cordate-ovate, many-lobed, white, with hairs beneath; the lobes obtuse; the petioles as long as the lamina. *Tendrils* short. *Flowers* axillary, solitary, stalked; *females* with the tube of the calyx globose, somewhat hispid, the limb campanulate, with narrow segments. *Petals* small. *Fruit* globose, smooth, yellow when ripe, with a thin solid rind and a very bitter flesh (D. C.)

Root annual, white, branched. *Stems* herbaceous, angular, branched. *Leaves* bright green on the upper side, paler and clothed with whitish hairs underneath. *Tendril* filiform, branching, opposite each leaf

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* The followers of Linnæus are by no means agreed with their great master, or among themselves, as to the true order of Cucumis, and some other cucurbitaceous genera. The male flowers have, apparently, three stamina; but of these two have an anomalous structure, and are regarded by some botanists as stamina with doubly-folded anthers; by others, as being composed each of two adherent stamina. Hence some have regarded the flowers as *triandrous*, some as *pentandrous;* the latter, taking into account the adhesion of the stamina, consider them to be *syngenesious*, *triadelphous* (*polyadelphous*), or *monadelphous*. So that while Linnæus adopted *Monœcia, Syngenesia*, as the class and order, Turton placed Cucumis in *Monœcia, Triandria*; Smith in *Monœcia, Pentandria*; or *Mon. Polyadelphia* (see his *Introd. to Botany*, p. 363, 4th ed.) Willdenow, Persoon, Loudon, &c. in *Monœcia, Monadelphia;* while Sprengel, in conformity with his modification of Linnæus's sexual system, places it in *Monadelphia Monandria*.

Calyx five-toothed. *Corolla* yellow with greenish veins. *Males: stamens* three, short, free; two of which have doubly bent anthers, or consist of two anthers; in which case the number of stamens is really five. *Females: ovarium* round, smooth, inferior; *style* short, cylindrical; *stigmas* three; *filaments* without anthers. *Fruit (pepo)* about the size of an orange, with a thin but solid rind.

Hab.—Japan, the sandy lands of Coromandel, Cape of Good Hope, Syria, Nubia, Egypt, Turkey, and the islands of the Grecian Archipelago. Cultivated in Spain.

Preparation of the Fruit.—The fruit is gathered in autumn, when ripe and yellow, and in most countries is peeled and dried, either by the sun or by stoves.

Commerce.—Colocynth is imported from Spain (Almeria, Gibraltar, Cadiz, Malaga, &c.), Trieste, Malta, Smyrna, Alexandretta, Mogadore, &c. It comes over in cases, casks, boxes, &c. In 1839, duty (2d. per lb.) was paid on 10,417 lbs.

Description.—The fruit called *colocynth* or *coloquintida (colocynthis; poma colocynthidis)* is imported either *peeled* (generally), or sometimes *unpeeled*. Its *pulp* (*pulpa colocynthidis exsiccata*) is nearly white, inodorous, light, spongy, porous, tough, intensely and nauseously bitter. The *seeds (semina colocynthidis)* are smooth, either white or yellowish white *(white colocynth seeds)*, or brownish *(black colocynth seeds)*, bitter (especially the dark-coloured ones) and inodorous. By digesting them in repeated portions of boiling water, and afterwards well washing them, the greater part of the bitterness may be extracted. Two kinds of colocynth, distinguished as *Turkey* and *Mogadore colocynth*, are known in commerce.

α. Turkey Colocynth: Peeled Colocynth.—This is imported from the Levant, Spain, &c. The usual size of each pepo is about two or three inches in diameter; the shape is more or less globular, according to the evenness with which the rind has been removed, and the degree of contraction in drying; the colour is white, or pale yellowish white. One hundred parts by weight are said to consist of 28 parts pulp, and 72 parts seeds.

β. Mogadore Colocynth: Unpeeled Colocynth.—The pepo of this kind is larger than the preceding, and is covered with a yellowish smooth, firm rind. It is imported from Mogadore in small quantity only, and is principally used by druggists for shew-bottles.

The seeds of colocynth are usually described as white, perfectly bland, and highly nutritious. Captain Lyon (Duncan, *Edinb. Dispens.*) states they constitute an important article of food in Northern Africa. "The seeds of Cucurbitaceæ," says Decandolle (*Essai sur les Prop. Méd. des Plantes*, 191), "do not participate in the qualities of the pulp which surround them; they are bland, demulcent, of an oily nature, and susceptible of easily taking the form of an emulsion." These statements do not apply to Colocynth seeds of commerce, which I never found devoid of bitterness; and Hillefeld (Marx, *Lehre v. d. Giften.* ii. 27) says a scruple of them purged a dog. Heise (*Ibid.* 34) found them poisonous.

Composition.—In 1817, Braconnot (*Journ. de Phys.* lxxxiv. 337) analyzed the watery extract. The pulp was analyzed in 1818 by Meissner (Pfaff's *Syst. d. Mat. Med.* vi. 365). Vauquelin *(Journ. de Pharm.* x. 416) examined the active principle.

Meissner's Analysis.

Bitter matter (*Colocynthin*)	14·4
Extractive	10·0
Bitter fixed oil	4·2
Resin insoluble in ether	13·2
Gum	9·5
Bassorin	3·0
Gummy extract (obtained from the ligneous fibre by potash)	17·0
Vegetable jelly	0·6
Phosphate of lime and magnesia	5·7
Ligneous fibre	19·2
Water	5·0
Colocynth Pulp	101·8

Braconnot's Analysis.

Bitter matter (*Colocynthin*), with some resin	41·4
Resin	4·3
Vegetable jelly (*pectin*)	18·6
Azotic matter	21·4
Acetate of potash	5·7
Deliquescent salt of potash not soluble in alcohol	7·1
Watery Extract of Colocynth	98·5

Colocynthin; Colocynthite; Bitter or *Purgative Principle of Colocynth.*—By digesting the watery extract of colocynth in alcohol, and evaporating the tincture thus procured, we obtain a mass, composed, according to Vauquelin, of a bitter principle and acetate of potash. A little water readily dissolves the latter, leaving the bitter resinoid matter, to which the name of *Colocynthin* has been applied. It is a yellowish brown, translucent, brittle substance, dissolving in water, but much more readily in alcohol. The aqueous solution is precipitated by the tincture of galls, and by some metallic solutions (protosulphate of iron, sulphate of copper, and nitrate of mercury).

Chemical Characteristics.—The cold infusion is pale yellow, and very bitter; nitrate of mercury, sulphate of copper, and acetate of lead, cause in it gelatinous-flocculent precipitates, (*pectates?*); sesquichloride of iron and tincture of nutgalls do not render it turbid. Powdered colocynth gives scarcely any evidence of the presence of starch, on mixing it with tincture of iodine and water.

Physiological Effects.—(*a.*) *On animals generally.*—The animals on whom the action of colocynth has been examined, are horses, dogs, sheep, and pigs. On dogs its operation appears to be analogous to that on man. Thus Viborg (Wibmer, *Wirk. d. Arzneim. u. Gifte.* ii. 230), states that two drachms caused in a dog violent vomiting and purging; and Orfila (*Toxicol. Gén.*) has shown that three drachms introduced into the stomach (the œsophagus being tied) are capable of causing death. It is remarkable, however, that its operation on horses is comparatively slight, at least according to the testimony of Viborg, Bourgelat, and Moiroud (*Pharm. Vét.* 274). The last-mentioned writer says he has given four drachms to a small horse without exciting the least disorder; and he adds that another cucurbitaceous plant (briony) has likewise very little effect on the horse.

(*b.*) *On Man.*—Thunberg (*Travels*, ii. 171) tells us that, at the Cape of Good Hope, the colocynth fruit is *said* to be eaten when pickled, both by the natives and colonists, although it is very bitter. This statement, however, is, *à priori*, so improbable, that we may fairly suspect some error, especially as Thunberg does not assert it on his own authority.

Colocynth taken in *small* or *moderate doses* acts as a very safe and useful purgative. Its operation is not limited to the acceleration of the vermicular movements, but is extended to the secreting and exhaling vessels of the alimentary canal, whose functions it promotes. Moreover, it stimulates the other abdominal organs; and after the absorption of its bitter acrid principle, it not unfrequently proves diuretic. *In full doses*, it operates as a very active or drastic cathartic and hydragogue; but I have never seen any ill effect from its use. These remarks apply to the compound extract, the only preparation of colocynth of which I have personal experience. It would appear, partly from observation in the human subject, and also from the experiments of Orfila on dogs, that colocynth is one of those purgatives which exert a specific stimulant influence over the large intestines.

In excessive doses, colocynth, both in powder and decoction, has on several occasions operated as a mortal poison, causing violent vomiting and purging, griping pain, and other symptoms of gastro-intestinal inflammation. A tea-spoonful and a half of the powder (about ʒiss.) has proved fatal (Christison, *On Poisons*). In a case related by Orfila (*Toxicol. Gén.*) there were, besides the preceding symptoms, dimness of sight and slight delirium. In M. Carron d'Annecy's case (*Ibid.*) the purging was followed by extreme tension and tenderness of belly, suppression of stools and urine, retraction of the testicles, and priapism. On a post-mortem examination there were found, besides the usual evidences of inflammation of the bowels, traces of inflammation of the liver, kidneys, and the bladder.

Considered in relation to other cathartics, colocynth will be found to rank near gamboge, from which it is distinguished by at least two circumstances: first, its cathartic effect is not the mere result of its topical acrid operation, but, in part, of its specific influence over the bowels; secondly, its action on the large intestine is more manifest than that of gamboge. In the latter property, colocynth approximates to aloes; but while it greatly exceeds the latter in its cathartic and hydragogue effects, it is devoid of the tonic influence possessed by aloes, when used in small doses.

Uses.—Besides being useful as an ordinary purgative, colocynth is adapted for acting as a stimulus to the abdominal and pelvic vessels and nerves in cases of torpor or inactivity, and, on the principle of counter-irritation already explained (p. 45), for determining from other organs. The objections to its use are acute inflammatory affections of the alimentary canal, diseases of the large intestine, &c. The following are the principal cases in which it is employed.

1. *In Habitual Constipation.*—As an ordinary purgative for keeping the bowels regular, the compound extract of colocynth is in common use both among the public and medical men. It operates mildly, certainly, and effectually. I am acquainted with individuals who have taken this substance for years, without suffering any inconvenience therefrom. The simple extract is sometimes employed as a substitute, but is less advantageous.

2. *In Alvine Obstruction.*—In some cases of obstinate constipation, with sickness and other symptoms of an extremely irritable stomach, the compound extract of colocynth occasionally proves invaluable. Occupying but a small bulk, it is retained on the stomach, and succeeds in producing alvine evacuations, where the ordinary liquid purgatives fail, in consequence of being vomited up. Doubtful cases of intus-susception and hernia, even with stercoraceous vomiting, I have seen completely relieved by it. More than once have I known an operation averted by its use, in those who, in addition to the above symptoms, had old herniæ, which led the surgeon to suspect strangulation. A slight degree of abdominal tenderness is not to be considered as absolutely prohibiting its

use. Occasionally the extract is rubbed down with soap and water, and administered as an enema (see *Enema Colocynthidis.*)

3. *In Diseases of the Brain.*—In apoplexy, or a tendency thereto, in paralysis, insanity, violent headache, &c. colocynth is sometimes employed with good effect, on the principle of revulsion or counter-irritation.

4. *In Dropsy.*—In dropsical affections, colocynth has been used as a *hydragogue*. But in this country it is less frequently employed for this than for other purposes: various other hydragogues (especially elaterium and jalap) being usually preferred. It is sometimes employed as a *diuretic*, being given in the form of decoction. Hufeland regarded it as a most effectual diuretic in persons of a cold and sluggish habit of body (Eberle, *Mat. Med.* i. 119, 2nd ed.)

5. *In Amenorrhœa and Chlorosis.*—In some cases of obstructed menstruation, benefit is obtained by the use of drastic purgatives, like colocynth, which act on the rectum, and, by contiguous sympathy, affect the uterus.

Administration.—The *powder*, which is rarely used, may be administered in doses of from two to eight or ten grains, intimately mixed with some mild powder (gum, or starch). The *decoction* (prepared by boiling ℈ij. of colocynth in Oj. of water for six minutes, and, according to Hufeland, adding to the strained liquor, f℈ij. of the spirit of sulphuric ether, and f℥j. of syrup of orange peel) is given in doses of f℈ss. three times a day. The *tincture* (prepared according to the Prussian Pharmacopœia, by digesting ℥j. of colocynth pulp and ʒj. of star-anise in lb. j. of rectified spirit) is given in doses of twenty drops. Colocynth has been employed iatraleptically (see p. 48) by Dr. Chrestien (*Méth. Iatral.* p. 172). The tincture of colocynth, or twenty grains of the powder mixed with hog's-lard, were used by way of friction on the abdomen and inner side of the thighs, in disorders of the intellectual functions. Diuresis was a common effect. The following are the officinal preparations of colocynth.

1. Extractum Colocynthidis, L. E. D. (Colocynth pulp [in pieces, *L.*] lb. j.; Water [Distilled, *L.*] *Cong.* ij. [*Cong.* j. *D.*] Mix and boil with a slow fire for six hours, frequently adding distilled water, that it may always fill the same measure. Strain the liquor while hot; lastly, evaporate it to a proper consistence, *L.*—The directions of the *Edinburgh College* are essentially the same, except that the evaporation is directed to be effected by the vapour bath.—The *Dublin College* directs the mixture to be boiled down to four pints, and the liquor filtered while hot; then evaporated to a proper consistence.)—When the decoction is very concentrated, it readily gelatinizes on cooling; hence it is necessary to strain it while hot. At Apothecaries' Hall, the produce of 100 lbs. of pulp is about 65 lbs. of extract (Barker and Montgomery, *Observ. on the Dub. Pharm.*) Extract of colocynth is an objectionable preparation, as it is very apt to become either mouldy or tough and hard by keeping. The dose of it is grs. v. to ℈j.

2. Extractum Colocynthidis compositum, L. D. *Pilulæ Colocynthidis*, E. (Colocynth pulp, cut in pieces, ℥vj.; Purified Extract of Aloes [Hepatic Aloes, *D.*] ℥xij.; Scammony, powdered, ℥iv.; Cardamom Seeds, powdered, ℥j.; Soap, ℥iij.; Proof Spirit, *Cong.* j. [wine measure, *D.*]

Macerate the colocynth in the spirit, with a gentle heat, for four days. Strain the spirit, and add to it the aloes, scammony, and soap; afterwards evaporate to a proper consistence, the cardamom being mixed towards the end, *L.*—The process of the *Dublin College* is essentially the same.—The process of the *Edinburgh College* is as follows:—"Socotrine or East Indian Aloes, and Scammony, of each, eight parts; Colocynth, four parts; Sulphate of Potash, and Oil of Cloves, of each, one part; Rectified Spirit, a sufficiency. Pulverize the aloes, scammony, and sulphate of potash together; mix with them the colocynth previously reduced to fine powder; add the oil of cloves; and, with the aid of a small quantity of rectified spirit, beat the whole into a proper pill mass, which is to be divided into five-grain pills.")—Compound extract of colocynth, made according to the London Pharmacopœia, is an exceedingly valuable preparation; but owing to carelessness, inattention, fraud, or ignorance, the preparation of the shops is very unequal in its powers. The aloes used in the process should be purified (by straining) as directed by the London College: the necessity of this will be obvious to any one who has ever seen a *cwt.* of aloes melted. Should the Cape variety be substituted for the finer kind of aloes, the odour would detect the fraud. The scammony employed should be of the best quality (see p. 883). If the common (*i. e.* adulterated) kinds be used, the activity of the preparation is thereby deteriorated. If the compound extract, rolled into a ball and dropped into water, effervesce on the addition of hydrochloric acid, we may infer that the scammony employed was adulterated with chalk. If the filtered decoction, slightly acidified, become blue or purplish on the addition of tincture of iodine, the presence of some starchy substance (as jalap or adulterated scammony) may be inferred. The mode of detecting gamboge will be described hereafter (see *Gamboge*). If colocynth seeds have been employed as a substitute for the pulp, the tenacity of the extract, I am told, is greatly deteriorated. Some druggists substitute oil of cardamoms for the powder of the seeds, and by this means increase the odour of the preparation; but unless some inert powder be added, to compensate for the powder of the seeds omitted, the strength of the preparation would be somewhat greater than that intended in the pharmacopœia.

Compound extract of colocynth is a powerful, sure, yet safe cathartic. Its uses are the same as those of colocynth before described. The dose of it is from five grains to a scruple. Calomel is frequently given in combination with it. The *pilulæ catharticæ compositæ*, U. S. (before noticed, p. 472) contains the compound extract of colocynth, extract of jalap, and calomel. Extract of hyoscyamus is frequently given in conjunction with the compound extract of colocynth. (See *pilulæ colocynthidis et hyoscyami*, E.)

In the shops a cheap substitute for the compound extract of colocynth is often sold under the name of *pill cochiæ* (*pilulæ cocciæ*, or *pilulæ cochiæ minores* of Galen). The substance sold under this name at Apothecaries' Hall, London, is the *pilulæ colocynthidis*, Ph. Ed. without the sulphate of potash.

Colocynth is a constituent of *Morison's Pills*. (See Frazer's report of the *Trial of Joseph Webb*, at York Summer Assizes, 1834, p. 53.)

3. *Pilulæ Colocynthidis et Hyoscyami*, E. (Colocynth-pill mass,

ʒij.; Extract of Hyoscyamus, ʒj. Beat them well together, adding a few drops of rectified spirit, if necessary; and divide the mass into thirty-six pills.)—Extract of hyoscyamus diminishes the pain and griping frequently experienced from the use of colocynth, but does not injure its evacuant properties. Both Sir H. Halford and Dr. Paris (*Pharmacologia*, i. 299, 6th ed.) bear testimony to this. The dose of this pill is grs. v. to grs. xv.

4. *Enema Colocynthidis*, L. (Compound Extract of Colocynth, ℈ij.; Soft Soap, ℥j.; Water, Oj. Mix, and rub them together.)—A useful cathartic enema in obstinate constipation, whether arising from colic, or from other non-inflammatory conditions.

Antidote.—See *Elaterium*.

Momor'dica Elate'rium, Linn. L. E. D.—*Squirting Cucumber.*

Ecbalium officinale, *Nees & Ebermaier.*

Sex. Syst. Monœcia, Syngenesia. *Linn.**

(Pepones recentes, *L.*—Feculence of the juice of the fruit, *E.*—Fructûs; Fæcula, Folia; *D.*)

History.—The term ἐλατήριον (from ἐλαυνω, *I impel* or *urge forward*) was employed by the Greeks to signify, not merely a medicine prepared from the σίκυς ἄγριος, or *wild cucumber* (*Momordica Elaterium*), but also any purgative substance (Fœsius, *Œconom. Hipp.*) Hippocrates (*Opera*, ed. Fœs. pp. 418, 547, and 877) employed the root and leaves of the plant, as well as ἐλατήριον, in medicine. Dioscorides (lib. iv. cap. 155) minutely describes the method of preparing ἐλατήριον by drying the feculence of the expressed juice of the fruit, and making it into troches. Pliny (*Hist. Nat.* lib. xx. cap. 1 & 2, ed. Valp.) calls the plant *cucumis sylvestris*, and gives a short account of the method of making elaterium. C. Bauhin (*Pinax*, 314) terms the plant *cucumis asininus*, or *asses' cucumber*.

Botany. *Gen. Char.*—*Flowers* monœcious, yellow, or white; with a filiform peduncle having one bract (always?). *Males: calyx* five-cleft, with a very short tube. *Corolla* five-parted. *Stamens* triadelphous; *anthers* connate. *Females*: *filaments* three? (rather five, triadelphous), sterile. *Style* three-cleft. *Ovarium* bilocular. *Fruit* often (always?) muricate, opening with elasticity when ripe. *Seeds* compressed, reticulated when ripe (always?). (D. C.)

Sp. Char.—Hispid, rough, glaucous. *Stem* short, without tendrils. *Leaves* cordate, somewhat lobed, crenate-dentate, very rugose on long stalks. *Fruit* ovate, obtuse, hispid-rough, with long peduncles. *Seeds* chestnut-brown (D. C.)

Root annual. *Stem* thick, round, trailing, and branching. *Leaves* obtuse, grayish and strongly reticulated on the under side; petioles long and bristly. *Flowers* axillary, the males form racemes of five or six flowers. *Calyx* adherent, with five, lanceolate, acute teeth. *Corolla* campanulate, yellow, reticulated with green veins. *Males: Stamina* three, two of which bear doubly-folded anthers [or five, four

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* See the note to Cucumis Colocynthis, p. 1074.

of which cohere, so as to form two bundles of two anthers each]. *Females: filaments* three, sterile; *ovarium* inferior, one-celled (spuriously three-celled); *style* simple; *stigmas* three, bifid. *Pepo* small, elliptical, pedunculated, grayish-green, covered with soft prickles; when ripe separating from its stalk, and expelling, with considerable violence, its brown seeds, and a thin mucus through the aperture at the insertion of the stalk.

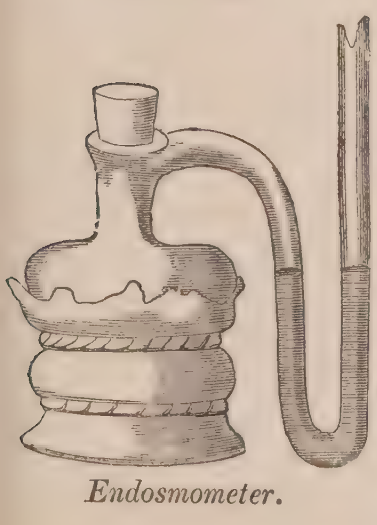
The phenomenon of the expulsion of the seeds of this plant has acquired, of late years, increased interest, from the circumstance of Dutrochet (*Nouv. Rech. sur l'End.* p. 66, 1828) having adduced it as one of the effects of *endosmosis*. It is well known that when two fluids of unequal density are separated from each other by membrane (animal or vegetable), a double permeation of fluids takes place,—that is, each fluid passes through the membrane, and mixes with the other fluid: the current in one direction is called *endosmosis*, that in the opposite direction *exosmosis*. The instrument employed by Dutrochet in conducting his experiments he called an *endosmometer:* it consists of a bell-shaped glass vessel (a bottomless bottle, for example), closed at the lower end by bladder, at the neck by a cork, through which passes a straight tube; or we may have a curved tube issuing from the side of the neck (as in Fig. 198).

Fig. 197.

Momordica Elaterium.
a. Pepo expelling its seeds.
b. Stalk.
c. Transverse section of the pepo.

If syrup be put into the bell, and the bell then immersed in water, a portion of syrup will exude through the bladder, while a larger quantity of water will pass in; and if mercury be placed in the curved portion of the tube (as in Fig. 198), the liquid metal is pushed up. If, on the other hand, the bell contain water, and be immersed in syrup, the stronger current is from within outwards. In other words, the stronger current is, in general, from the lighter towards the denser fluid. Hence we comprehend why cherries and plumbs shrivel when preserved in syrup, but remain plump in brandy: in the first place exosmosis preponderates because the syrup is denser than the juice of the fruit,—in the second, endosmosis, because the juice is denser than the brandy: the separating membrane is, of course, the skin or epicarp of the fruit.

Fig. 198.



Endosmometer.

Now to apply these facts to the phenomena of the Elaterium apple. In the centre of this fruit, and surrounding the seeds, is a very singular variety of organic matter, which appears like thick mucus. It is called by some botanists *placentary matter* (see Fig. 197, *c*). More external to this, that is, in the tissue of the pericarp, there is another organic liquid, whose density is less than that of the placentary matter. Now these two fluids being separated from each other by membrane, are in the exact condition for the operation of endosmosis; consequently the central cell gradually becomes very much distended (at the expense of the liquid in the tissue of the pericarp), and ultimately gives way at the weakest point—namely, where the peduncle is articulated with the fruit, and the contents of the cells are expelled with great violence, from the sudden contraction of the distended tissues.

Seat of elaterium.—Some years since Dr. Clutterbuck (*Lond. Med. Rep.* vol. xii.) ascertained that the active substance, elaterium, "is neither lodged in the roots, leaves, flowers, nor stalks, in any considerable quantity; nor is it to be found in the body of the fruit itself, or in the seeds contained within it; it was only in the juice around the seeds therefore, that it could be looked for," and here it was found.

The precise situation of it will be readily comprehended by inspecting a transverse section of the elaterium pepo (see fig. 197, *c*.) We observe that the external portion of the pericarp (namely, the epicarp) is furnished with rigid hairs; within the epicarp is a whitish sarcocarp, forming what Dr. Clutterbuck terms the body of the fruit. The centre of the fruit is divided into three cells, by projections of the three parietal placentæ to which the seeds are attached. Between these projections, and surrounding the seeds, is the *pulp*, *the placentary matter*, or the *juice around the seeds* (Clutterbuck). It is paler than the sarcocarp, and is composed of a very lax tissue, which, as the fruit maturates, takes on, says Aug. St.-Hilaire, a gelatinous consistence, becomes disorganized, and melts into water.

"The centre of the fruit of Memordica Elaterium," says Dutrochet (*op. cit.* p. 69) "contains a very singular organic substance, and which has no resemblance to any other vegetable tissue. It seems to be a green very thick mucus. Viewed by the microscope, it appears to consist of an immense quantity of very small globules, agglomerated sometimes confusedly, sometimes so as to form irregular striæ. This substance is penetrated by a whitish liquid, by a sort of emulsion, which is so much the more dense as we observe it at an epoch nearer maturity. This aqueous liquid escapes immediately we open the green fruit. By the microscope we see some almost imperceptible globules which swim in this liquid. At the epoch of maturity this whitish liquid is much more abundant, and at the same time much denser; the globules, which it holds in suspension, have become much larger."

Hab.—South of Europe. Common on rubbish in the villages of Greece and the Archipelago. A few acres are annually cultivated at Mitcham.

Extraction of Elaterium.—The following directions are given by Dr. Clutterbuck for obtaining elaterium:—"The cucumbers should be gathered when nearly as ripe as possible, and without violence that might endanger their bursting. They should then be wetted by the affusion of cold water, that less of the juice when they are cut may adhere to the external surface. In this state they should be cut through longitudinally, and the juice allowed to strain through a fine sieve, placed in a large earthenware vessel. The seeds and surrounding pulp should be scooped out upon the sieve, and washed with repeated affusions of cold water, by which they will be freed from all adhering juice. Something will be saved also by afterwards rinsing the split cucumbers themselves in cold water, from which a portion of elaterium may be collected.

"After standing a few hours a sediment is formed, from which the clear liquor is to be poured off; it is then to be thinly spread on fine linen, and exposed to the air to dry; a gentle warmth may be employed without injury; but the access of sunshine destroys the fine green colour which the substance otherwise acquires." From forty fruits, Dr. Clutterbuck obtained only six grains of elaterium. The elaterium thus procured is of the finest quality; but the product is very small. Hence, to increase the quantity, slight pressure is employed.

The directions of the British colleges are less explicit than these. The London and Dublin Colleges direct the fruit to be gathered when ripe. The Edinburgh College, "before it is quite ripe." All direct gentle pressure to be employed. But, as Dr. Clutterbuck has justly observed, "pressure is not at all necessary in order to obtain the elaterium, and can only serve to deteriorate its quality, and render the dose uncertain." The Dublin College orders the elaterium to be received on a linen cloth, covered with another, and dried with a medium [*i. e.* between 100° F. and 300° F.] heat. At Mitcham, women are usually employed in the preparation of elaterium.

After the elaterium has deposited from the juice, a mucilaginous matter subsides, which greatly deteriorates the elaterium (if it has not been previously separated), and renders it when dry, dark, gummy, and much curled.

Description.—The Elaterium (*elaterium: extractum elaterii*, L. E. D. seu *elaterium*, D.) of commerce, is a very variable article. Two kinds are distinguished, the *English* and the *Maltese*.

1. *English Elaterium* (*Elaterium anglicum*) is manufactured at Apothecaries' Hall, at Mitcham, and perhaps at other places. The *finest* (*elaterium album*, Auct.) occurs in light, friable, thin, very slightly curled flakes, or flat cakes, or fragments, which frequently bear the impression of the muslin on which the elaterium was dried. Its colour is pale, grayish green, which by exposure to light becomes yellowish. Its taste is acrid and bitterish; it has a faint animal odour (not very dissimilar to that of ergot of rye), but combined with a fragrancy which reminds me of senna or tea. By keeping nine or ten years, a sample of good elaterium in my museum has assumed a sparkling appearance, as if it contained very minute crystals.

Inferior kinds (*elaterium nigrum*, Auct.) are sometimes hard, break with difficulty, or with a resinous fracture, are much curled, gummy, and dark coloured (brown or olive-green). They are probably prepared from the juice, after the finest elaterium has been separated. In my museum, I have several varieties of this inferior kind, which were collected by Dr. Clutterbuck. One is in the form of a brownish powder.

Dr. Clutterbuck states, that of the best specimens of elaterium from Apothecaries' Hall, spirit dissolves more than half; while of inferior sorts, a fourth part only is dissolved. Mr. Barry (Paris, *Pharmacol.*) says that the solubility of elaterium, manufactured by Dr. Clutterbuck's process, is as follows:—

Ten grains of Elaterium, manufactured according to Dr. Clutterbuck's process.		Dissolved in Spirit, of Specific Gravity 0·809.
By Messrs. Allen and Co.	1st sample	5·5 grains.
	2d sample	6·2 grains.
	3d sample	6.4 grains.
At Apothecaries' Hall		6 grains.

2. *Maltese Elaterium* (*Elaterium melitense*).—This is imported from Malta. It is in much larger flakes than the best English elaterium, and frequently has some adherent paper on which it has been dried; its colour is much paler, sometimes with hardly a trace of green. Some specimens are more friable and softer, and occasionally are rather chalky to the touch. My specimens are mixtures of chalk and starch, hence they effervesce with acids, and become blue with iodine. I am assured that Maltese elaterium is mixed, in this country, with buckthorn juice to deepen its colour, and promote its purgative operation.

Composition.—Braconnot (*Journ. Phys.* lxxxiv. 292) analyzed the expressed, boiled, filtered, and evaporated juice of the plant. Soon after Dr. Clutterbuck's experiments on elaterium, Dr. Paris (*Pharmacologia*) analyzed this substance. In 1831, Mr. Hennell (*Journ. of the Royal Institution*, i. 532) published an analysis of it. In 1835, Landerer (*Pharm. Central-Blatt. für* 1835, 154) examined the juice of the fruit growing in Nauplia (Napoli). Furthermore, the active principle of elaterium was examined in 1831 by Dr. Morris (*Ed. Med. and Surg. Journ.* xxxv. 339), and afterwards by Marquart (*Pharm. Central-Blatt. für* 1833, S. 850).

Dr. Paris's Analysis.

Elatin / Bitter matter	1·2
Extractive	2·6
Fecula	2·8
Gluten	0·5
Woody matter	2·5
Water	0·4
Elaterium	10·0

Mr. Hennell's Analysis.

Crystallizable substance (*Elaterin*)	44
Green resin	17
Starch	6
Woody fibre	27
Saline matters	7
Elaterium	101

1. *Elaterin* (*Elaterine; Momordicine*). Dr. Clutterbuck shewed, in 1819, that the active principle of elaterium was insoluble in water, but soluble in alcohol; for he found a watery infusion of eight grains had no effect, whereas the alcoholic extract in the dose of one-sixteenth of a grain produced considerable purging, and often vomiting; and when the dose was increased to a quarter of a grain the effect was more considerable, and often took place in a very few minutes. The action of these liquids on elaterium led Dr. Clutterbuck to believe that the active principle was of a resinous nature. But the alcoholic tincture of elaterium contains three principles: elaterin, the green resin, and a bitter matter. By treating this alcoholic extract with boiling distilled water, the bitter matter is dissolved: the residue (elaterin and green resin) was termed by Dr. Paris *elatin*. Dr. Morries, in 1831, separated the green resin and isolated elaterin; though Mr. Hennell seems to have discovered it about the same time. Dr. Morries obtained it by evaporating the alcoholic tincture of elaterium to the consistence of thin oil, and then throwing it into boiling distilled water, a white crystalline precipitate was formed, which increased as the liquor cools. This precipitate was afterwards purified by a second solution in alcohol and subsequent precipitation by water. Mr. Hennell's process was different. He separated the resin from the crystalline matter of the alcoholic extract of elaterium by ether, which took up the resin and left the elaterium; the latter was then purified by solution in hot alcohol and subsequent crystallization. Marquart's process is less likely to yield pure elaterium, since he procured it from an extract prepared by evaporating the expressed juice. Another method (founded I presume on the directions of the Edinburgh College, for the determination of the goodness of elaterium, see p. 1085) is to treat the alcoholic extract of elaterium with a solution of potash, which takes up the bitter matter and the resin, and leaves the elaterin. The quantity of elaterin in elaterium is thus stated by different authorities:

100 *parts of Elaterium.*	*Quantity of Elaterin.*
Prepared according to the London College (*Hennell*)	44
Best British Elaterium (*Morries*)	26
Worst ditto (*Morries*)	15
French Elaterium (*Morries*)	5 or 6
Elaterium (*Edinburgh Pharmacopœia*)	14·3 at least.
Best specimens (*Balmer*, Lond. Med. Gaz. xxv. 909)	33
Fine sample, prepared at Apothecaries' Hall in 1839, and dried by steam heat (*Pereira*)	26

These discrepancies must arise principally from the different degrees of goodness of samples examined; but partly also from different modes of proceeding. I found that 30 grs. of fine elaterium prepared at Apothecaries' Hall in 1839, lost by drying on a steam bath 1·5 grs. Boiled in repeated portions of rectified spirit, the dried mass lost

18 grs. The concentrated green tincture poured into diluted liquor potassæ (see process of the *Edinburgh Pharmacopœia*, below) deposited crystals which dried by steam heat weighed 7·5 grs.

Elaterin possesses the following qualities: it is crystalline, and has a silky appearance; the crystals viewed by a magnifying glass, are observed to be rhombic prisms with striated sides; it is very bitter, but odourless; is neither acid nor alkaline, and is, insoluble in water, but soluble in hot alcohol. Mr. Hennell says it is only very slightly soluble in ether; whereas Dr. Morries states it to be readily soluble in both ether and fixed oil. It is fusible, according to Mr. Hennell, at 350° F. The latter chemist states that it is composed of *Carbon* 36·9, *Hydrogen* 23·9, and *Oxygen* 39·2, which nearly corresponds to the formula $C^6\ H^{12}\ O^5$. Dr. Morries says, that at a high temperature it is dissipated in a thick, white, pungent vapour, having an ammoniacal odour: if so, nitrogen must be a constituent. But neither by the odour, nor by turmeric, can I detect ammonia in this vapour. The late Dr. Duncan, of Edinburgh, ascertained that in doses of one-twelfth or one-sixteenth of a grain it had all the effects of a dose of elaterium. "A tenth of a grain," says Dr. Christison, "as I have myself witnessed, will sometimes cause purging in man; and a fifth of a grain, in two doses, administered at an interval of twenty-four hours to a rabbit, killed it in seventeen hours after the second dose." Dr. Golding Bird thinks one-sixteenth of a grain a fair dose to commence with: he repeats it every two hours until some effect is produced. It may be taken dissolved in spirit, and by this diffused through an aqueous vehicle.

2. *Green Resin* (*Chlorophylle?*)—Is insoluble in water, but dissolves in alcohol, ether, and caustic potash. It does not redden litmus, though from its ready solubility in caustic potash its acid nature might be suspected. Some of it prepared by Mr. Hennell was tried at St. Bartholomew's Hospital, and found to act powerfully as a purgative in doses of less than a third of a grain. Perhaps this might have arisen from the presence of elaterin; for twenty-one grains of the resin yielded four grains of elaterin.

3. *Bitter matter.*—This is soluble both in water and alcohol. Its taste is intensely bitter: its colour is brownish yellow.

Characteristics.—Good elaterium is friable, has a pale greenish-gray colour, and an animal odour. Digested in rectified spirit it yields a fine green tincture. Thrown into water it swims. It does not effervesce in diluted hydrochloric acid: the acid liquor being digested on elaterium, and subsequently rendered nearly neutral by ammonia, gives scarcely any cloudiness on the addition of oxalate of ammonia. Touched with tincture of iodine, it gives no evidence of the presence of starch; though if it be boiled in water, the decoction, when cold, gives traces of starch by the blue colour developed on the addition of iodine. If the cinder formed by the burning of elaterium in the air be ignited in the outer cone of the flame of a candle, the presence of potash is indicated by the bluish or violet tinge.

Maltese elaterium has no odour, and scarcely any green tinge. Examined by the microscope, it is found to contain globules of wheaten starch. It sinks in water, effervesces with diluted hydrochloric acid, yielding a solution which, when nearly neutralized by ammonia, gives a copious white precipitate (*oxalate of lime*) on the addition of oxalate of ammonia. Tincture of iodine stains it bluish or greenish black (*iodide of starch*). If the cinder obtained by burning Maltese elaterium in the air be ignited in the outer cone of the flame of the candle, it communicates an orange tint to the flame. The adulteration of elaterium by starch was known to Dioscorides. The *Edinburgh College* gives the following characteristics of good elaterium:—

"Colour pale-gray: when exhausted by rectified spirit, the solution, concentrated, and poured into hot diluted aqua potassæ, deposits, on cooling, minute silky, colourless crystals, weighing at least a seventh of the elaterium."

But these characteristics are not sufficiently accurate. Good elaterium is pale *greenish*-gray; and when treated as the College directs, should yield 26 per cent. of crystals (*i. e.* elaterin).

Physiological Effects. (*a.*) *On Vegetables.*—Macaire found a branch of the Momordica Elaterium was speedily destroyed by immersing it in a solution of the extract of this plant (*Mém. de la Soc. de Phys. de Genève*, vol. iv.)

(*b.*) *On Animals*—Viborg (Wibmer, *Wirk. d. Arzneim. ü. Gifte.* Bd. iii. S. 296) gave a pound of the fruit of Momordica Elaterium to the horse without any effect. Two and a half pounds of the whole plant (roots, leaves, and stem) also appeared inert.

The only experiments made with the extract of elaterium that I am acquainted with, are those of Orfila (*Tox. Gén.*) on dogs. They are three in number, and prove that this substance is a powerful local irritant, producing death even when it has been applied to the cellular tissue of the thigh, in consequence, as he supposes, of the nervous system being sympathetically affected. Moreover, he concludes, from his observations, that elaterium exerts a special action on the rectum.

(*c.*) *On Man.*—The acridity of elaterium in its local operation is well shown by various facts. Pliny truly observes that the juice of the elaterium apple is dangerous when applied to the eye; and Dr. Clutterbuck mentions that some of it "getting accidentally into the eye in one instance, it occasioned severe pain and inflammation, with an erysipelatous swelling of the eyelids, that continued till the following day." We have a further proof of its irritant properties in the inflammation and ulceration of the fingers of those employed in its preparation.

When swallowed, therefore, it irritates the gastro-intestinal membrane, and occasions vomiting and violent purging; hence it is called a *drastic purgative.* Fine elaterium, in the dose of 1-8th of a grain, seldom fails to purge violently, and sometimes to vomit. This was long since noticed by Dr. Clutterbuck, and I can verify his statement from repeated observations. Even 1-16th of a grain will generally excite considerable purging.

The elaterium of the shops, however, is rarely so active as this, and I have known two grains given with no more effect than the pure elaterium would excite in the dose of 1-8th of a grain. Elaterium powerfully excites the secreting and exhaling vessels of the alimentary canal, and thereby occasions very watery stools; hence the term *hydragogue* applied to it. In some dropsical cases I have known a single dose discharge several pints of fluid by the bowels. The gripings and the increased number of evacuations prove that the irritation is not confined to the mucous coat, but is extended to the muscular coat. Under the influence of a full dose, the pulse is excited, the tongue becomes dry, and sometimes furred, and great thirst is produced. Occasionally the skin becomes damp under the operation of elaterium.

Elaterium has been supposed to exert a specific influence over the uterus. Thus Dioscorides and even later writers state that it provokes the menses, and is apt to produce the death of the fœtus in utero. Its uterine influence, however, is probably not greater, in proportion to its cathartic property, than that of other violent drastics, which act powerfully on the large intestines.

Does elaterium become absorbed? We have no stronger evidence to offer in favour of the affirmative of this question than that mentioned by Hippocrates (Επιδημιον, lib. vi. sect. 5) that the milk of women and goats who have eaten elaterium, or the wild cucumber, possesses purgative properties. Furthermore, the accident which occurred to Dr. Robert Dickson, Lecturer on Botany at St. George's Hospital, seems to prove that absorption must have taken place by the skin (see *Journ. de Chim. Méd.* iv. 61). Dr. Dickson carried a specimen of the plant in his hat to his lodgings, in Paris, from the Jardin-du-Roi. In half an hour he experienced violent headache, which was followed by colicky pain, violent purging, vomiting, and fever.

Considered with respect to other cathartics, we find it pre-eminently distinguished by the violence of its purgative effect. Croton oil alone approximates to it. Its hydragogue operation exceeds that of most, if not all other, ordinarily used drastics.

Uses.—The principal use of elaterium is to excite watery evacuations *in dropsy*, by which a two-fold effect is to be hoped for; viz. *first*, absorption of the effused fluid; *secondly*, the stoppage of any further effusion in consequence of the metastasis of vital action from the seat of the dropsy to the intestinal membrane. In dropsies dependent on, or accompanied with, disease of the kidney, the evacuation of water by the bowels is much to be preferred to the employment of stimulating diuretics which may add to the severity of the renal malady. Of the violent hydragogue purgatives, elaterium I believe to be the most useful in dropsy. It evacuates more watery fluid than the others; while, if it be good, its operations may be relied on. It is objectionable where there is great debility, and where any inflammatory or other disease of the bowels exists. I have seen the fatal termination of dropsy apparently accelerated by the use of elaterium. A dropsical patient, much debilitated, took, by order of his physician, a dose of elaterium, which caused excessive alvine evacuations, great exhaustion, sinking of the pulse, syncope and death. Where no contra-indication to the use of elaterium exists, one or two doses of it should be given every other day, for a week or ten days. If continued longer than this, it might perhaps bring on an inflammatory condition of the bowels. Dr. Darwall (*Cyclop. Pract. Med.* art. *Anasarca*, vol. i. p. 79) mentions a case in which hypercatharsis and maniacal delirium were produced by the prolonged use of elaterium; the delirium, however, went off in a few hours. Some tonic (usually gentian) is commonly conjoined with elaterium. Thus a pill composed of elaterium and extract of gentian is frequently employed; or we may exhibit infusion of gentian on alternate days with the elaterium. Where there is a febrile condition of system, and also where there is an irritable or inflammatory condition of the alimentary canal, elaterium is inadmissible. It is best adapted for cold phlegmatic constitutions. Sydenham (*Works* by Dr. Pechey, p. 393, 4th ed. 1705) recommended elaterium in dropsy. Afterwards Lister (*De hydrope*), Heberden (*Comment.* art. *Dropsy*), Ferriar (*Med. Hist. et Reflex.* vol. iv.), Clutterbuck (*Lectures* in *Lancet* for May 6th, 1826, p. 170), and other experienced practitioners, bore testimony to its exceeding great efficacy. But judging by the doses recommended, all of them, except the last-mentioned writer, seem to have been unaware of the great activity of the medicine when pure.

2. *In cerebral affections*, such as apoplexy, or a tendency to it (manifested by sleepiness, stupor, or giddiness), mania, &c., elaterium, as a

drastic purgative, sometimes proves serviceable on the principle of counter-irritation or revulsion (see p. 45).

3. *In obstinate constipation* from sluggishness of the intestinal tube, elaterium is occasionally useful. But care must be taken to ascertain that the constipation does not depend on any mechanical impediment (as hernia, intersusception, &c.) to the passage of the fæces.

4. *In gout.*—A combination of elaterium and opium has been found serviceable in gout (see p. 623. Also Sutton, *Tracts on Gout*, p. 201).

Administration.—The dose of good elaterium is from one-sixteenth to one-half of a grain. I hear and read of practitioners giving this substance to the extent of one, two, or even three grains; but this can only be from the bad quality of the drug. I have repeatedly employed, and seen others exhibit elaterium, and have always observed that a quarter of a grain of good elaterium acted very powerfully, sometimes bringing away several pints of fluid; and half a grain usually occasioning vomiting, as well as violent purging. I confess I should not venture to exhibit a grain of the same preparation. It is usually given in the form of pills. The basis of the pills may be extract of gentian.

As elaterin (the active principle of elaterium) is soluble in rectified spirit, a *tincture of elaterium* (*tinctura elaterii*) may be employed. It contains, besides elaterin, a bitter principle and green resin. *Elaterin* has been given either in powder (mixed with sixty-four times its weight of bitartrate of potash), or in solution in rectified spirit (*solutio elaterinæ*) by Dr. Golding Bird (*Lond. Med. Gaz.* xxv. 908) in doses of one-sixteenth to one-eighth of a grain (see p. 1085).

Antidotes.—In the event of a case of poisoning by elaterium, the remedies would be demulcent drinks and clysters, opium, the warm bath, and fomentations to the abdomen; stimulants (such as ammonia and brandy) if the circulation fail; bloodletting to subdue the inflammatory symptoms, should the state of the general system not contra-indicate it.

Other Cucurbitaceæ, Dietetical, Medicinal, or *Poisonous.*

The fruits of several cucurbitaceous plants are employed as articles of food. The Cucumber (*Cu'cumis sati'vus*), the Melon (*Cu'cumis Me'lo*), the Water Melon (*Cu'cumis Citrul'lus*), the Vegetable Marrow (*Cucur'bita ovif'era*), the Pumpkin or Pumpion (*Cucur'bita Pe'po*), and the Melon-Pumpkin or Squash (*Cucur'bita Melo'pepo*), are those in most frequent use. They contain a watery, sweet or acidulous cooling pulp, which is slightly nutritious when taken raw, and in some habits proves laxative.

The fresh root of *Bryonia dioica* is sold by herbalists under the name of *white briony* and *mandrake-root.** Fashioned into a rude representation of the human figure, I have seen it exhibited at an herb-shop as a sign. Bryony root contains a peculiar bitter matter called *bryonin.* The root operates as a violent emetic and purgative. I have seen one case of poisoning by it. The symptoms were those of cholera. As the accident occurred at the time when this disease was raging here, the practitioner who was called in, concluded it was a case of cholera, and mistook a piece of briony root shewn him as being part of what the patient had eaten, for a piece of turnip. The patient (a woman) recovered. Bryony root is employed as a topical application to bruised parts.

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* At p. 880, I stated, on the authority of an herb-dealer, that the root of Black Briony (*Tamus communis*) is occasionally sold as Mandrake; but I have reason to believe the information to be erroneous.

ORDER 54. MYRTA'CEÆ, *R. Brown.*—THE MYRTLE TRIBE.

CHARACTERS.—*Sepals* four—six, generally five, concreted into a tube, which is adnate to the ovary, sometimes distinct at the apex, and as far as the margin of the ovary, at other times concrete at the apex, and as far as the throat. *Petals* inserted on the calyx, as many as the sepals with which they alternate, and quincuncial in æstivation, very rarely absent. *Stamens* inserted with the petals, often in many rows, double, or generally many-times the number of the petals: *filaments* either free or variously all connected or polyadelphous, before flowering somewhat incurved; *anthers* ovate, bilocular, small, dehiscing by a double chink. *Carpella* four—six, generally five, by abortion often fewer, concrete into a many-celled ovary, which is adnate to the calyx. *Style*, composed of many partial styles concreted, and, therefore, called single, with a simple stigma. *Fruit* various, many-celled, many-seeded. *Seeds* various; *embryo* exalbuminous (D. C.)—*Trees* or *shrubs*. *Leaves* generally opposite, rarely alternate, exstipulate, quite entire, dotted with pellucid glands, and usually with a vein running parallel with their margin. *Inflorescence* variable; usually axillary. *Flowers* red, white, occasionally yellow, never blue.

PROPERTIES.—Aromatic volatile oil and astringent matter (especially the former) are the principles to which the medicinal properties of Myrtaceæ are referrible. The pellucid dotting of the leaves and other parts indicates the volatile oil.

Melaleu'ca mi'nor, Smith, L. E.—*The Lesser Melaleuca.*

Melaleuca Cajuputi: *Maton; Roxburgh.*

Sex. Syst. Polyadelphia, Icosandria.

(Oleum è foliis destillatum, *L.*—Volatile oil of the leaves, *E.*)

HISTORY.—This tree was described by Rumphius (*Herb. Amboin.* lib. ii. p. 76) under the names of *Arbor alba minor*, *Cajuputi*, *Daun kitsjil*, and *Caju-kilan*. It has got its name from its colour *kāyu-puti*, which signifies *white wood*, and hence its appellation, as given to it by Rumphius, *arbor alba* (*Mat. Indica*, i. 261; and Crawford, *Hist. Ind. Archip.* vol. i. p. 513).

BOTANY. *GEN. CHAR.*—Tube of the *calyx* almost hemispherical; limb five-partite. *Petals* five. Bundles of *stamens* five, elongated, alternate with the petals; *anthers* incumbent. *Style* filiform; *stigma* obtuse. *Capsule* connate with, and enclosed in, the thickened tube of the calyx, which is adnate at its base to the branch: three-celled, many-seeded. *Seeds* angular (D. C.)—*Trees* or *shrubs*. *Leaves* alternate or opposite, quite entire, equal at the base. *Flowers* sessile, or somewhat adnate, spiked or capitate, white, yellowish, or purplish.

SP. CHAR.—*Leaves* alternate, elliptical-lanceolate, somewhat acute, slightly falcate, three- five-nerved. *Flowers* spiked, rather distant. *Rachis*, *calyx*, and *branchlets*, villose (D. C.)

Trunk tolerably erect, but crooked; *bark* thick, spongy, whitish ash-coloured, the exterior lamina peeling off in thin flakes. *Branches* scattered, often drooping. *Leaves* short-stalked, while young silky, when full grown smooth, deep green, from three to five inches long, and from half to three-quarters of an inch broad, very aromatic when bruised. *Spikes* terminal. *Bracts* solitary, lanceolate. *Calyx* urceolate. *Corolla* white. *Filaments* from thirty to forty, united into five portions at the base: *anthers* with a yellow gland at the apex. *Style* rather longer than the stamina; *stigma* obscurely three-lobed; *ovary* ovate, united to the calyx. *Capsule* three-valved. (Condensed from Roxburgh, *Fl. Ind.* iii. 395; and *Trans. Med. Bot. Soc.* April 11, 1828).

Hab.—Moluccas.

Extraction of the Oil.—Rumphius (*Herb. Amboin.*) states that the leaves are gathered on a warm day, and placed in a sack, where they become hot and damp. They are then macerated in water, and left to ferment for a night, and afterwards submitted to distillation. Two sackfuls of the leaves yield scarcely three drachms of oil, which is limpid, pellucid, and volatile. Lesson (*Journ. de Chem. Méd.* iii. 237) has described the method of obtaining the oil at Bourou, one of the Molucca islands. The leaves, he says, are gathered in the latter end of September, and put into the cucurbit of a copper alembic, surmounted by a neck, terminated by a capital without a refrigeratory, and a sufficient quantity of water is then added. By distillation, this liquid is made to traverse a worm immersed in a hogshead filled with water, and is collected in a vessel; the oil which floats is very light, and of an herbaceous green colour, which is owing to chlorophylle, or perhaps a somewhat different resinous principle. By rectification it becomes colourless.

Description.—*Cajuput* or *Kÿapootie oil* (*oleum cajuputi*) is usually imported in green glass bottles (in appearance similar to long-necked beer bottles). Its colour is green, the tint being that of a strong solution of chloride of copper. It is transparent, limpid, of a strong penetrating smell, resembling the combined odour of camphor, rosemary, and cardamom, and of an aromatic camphoraceous taste, succeeded by a sensation of coolness like that caused by oil of peppermint. In the mass the odour is disagreeable, but in small quantity, as when rubbed on the hand, is much more fragrant. An apparently pure sample, which has been several years in my museum, has a sp. gr. of 0·925. Dr. Thomson (*Org. Chem.* 476) says, the sp. gr. varies from 0·914 to 0·927; while Mr. Brande (*Dict. of Pharm.*) states it to be 0·980. Oil of cajuput is soluble in alcohol. When carefully distilled with water, the first portion of oil which passes over is very light, and quite colourless; but towards the end of the process, a heavier and greenish oil distils over.

Composition.—According to Blanchet (quoted by Thomson, *op. cit.*) the composition of oil of cajuput is as follows:—

	Atoms.	*Eq. Wt.*	*Per Cent.*
Carbon	10	60	77·92
Hydrogen	9	9	11·69
Oxygen	1	8	10·39
Cajuputi Oil	1	77	100·00

Adulteration.—M. Guibourt (*Journ. de Chim. Méd.* vii. 612) detected in several samples of oil of cajuputi, oxide of copper in solution. It is, he says, easily recognised by shaking the oil with a solution of ferrocyanide of potassium, when a red precipitate (*ferrocyanide of copper*) is formed. To this metal, derived as is supposed from the copper vessels in which the oil has sojourned, M. Guibourt ascribes the green colour of the oil. This conclusion, however, is somewhat premature, for all the samples of the oil which I have examined were, though green quite devoid of copper; and Mr. Brande observes, that none of the samples which he has examined have contained even a trace of copper.

In 1831, oil of cajuputi was extolled as a remedy for cholera (*Lond. Med. Gaz.* viii.) In consequence of the great demand for it, which was thereby created, the price rose from two to fourteen shillings per ounce; and various imitations of it soon made their appearance in the market. One of these consisted of oil of rosemary flavoured with camphor and oil of cardamoms, and coloured. Except on this extraordinary occasion, the oil of cajuputi met with in the shops of this country, I believe to be pure as imported.

PHYSIOLOGICAL EFFECTS.—Cajuput oil is a powerful antispasmodic, diffusible stimulant and sudorific (see p. 76). From the ordinary distilled oils (as those of the labiate plants and umbelliferous fruits) it is distinguished by its stronger influence over the nervous system (evinced by its antispasmodic qualities) and by the greater diffusibility of its stimulant operation. It is allied to valerian (p. 969) between which and camphor (p. 791) it ought perhaps to be placed in a physiological classification; but in large doses, it does not disorder the mental faculties as these two medicines do.

USES.—Cajuput oil has acquired considerable celebrity among the Malays; and has been more frequently employed in Germany than in any other European nation. By British practitioners its uses have hitherto been very limited. *As a diffusible stimulant* it is useful where we wish promptly to raise the energy of the vital powers, especially when at the same time any spasmodic movements are to be allayed. With these views it has been employed in low fevers, paralytic affections, and cholera. In the last mentioned diseases it acquired an ephemeral reputation, in consequence of the favourable reports of Sir Matthew Tierney, and others (*Lond. Med. Gaz.* vol. viii. pp. 628, 683, 736, &c.) *As an antispasmodic*, it is a very efficacious remedy, in painful spasmodic affections of the stomach, and in flatulent colic; but of its uses in epilepsy, chorea, hysteria, tetanus, spasmodic asthma, and some other spasmodic diseases, in which its efficacy has been extolled by oriental and continental practitioners, I have no experience. *As a stimulating sudorific*, it proves occasionally useful in chronic rheumatism. *As an external remedy*, it is probably scarcely superior to most other volatile oils. It has sometimes been applied to a carious tooth, to relieve tooth-ache; and mixed with olive oil, has been used as a stimulating liniment in chronic rheumatism, painful affections, local paralysis, &c. As an *anthelmintic*, it was used by Rudolphi.

ADMINISTRATION.—The dose of it is from two to ten, or even more, drops. It may be taken on sugar, or in the form of an emulsion.

Caryophyl'lus aromat'icus, Linn. L. E.—*Clove-Tree.*

Euge'nia caryophylla'ta. *Thunberg. D.*

Sex. Syst. Icosandria, Monogynia.

(Flores nondum explicati, exsiccati; Oleum è floribus destillatum, *L.*—Dried undeveloped flower; Volatile oil of the undeveloped flowers, *E.*—Flores nondum explicati, et Oleum volatile, *D.*)

HISTORY.—The *garyophyllon* of Pliny (*Hist. Nat.* lib. xii. cap. 15, ed. Valp.) cannot have been our clove, since that naturalist describes it as being like a peppercorn, but larger and more brittle. Indeed it is not quite certain who first speaks of the clove. Paulus Ægineta (*De Re Medica*, lib. vii. cap. iii.) notices καρυόφυλλον, and I think probably refers to the clove; though Sprengel (*Hist. Rei Herb.* i. 217) regards Simeon Seth as the first who mentions cloves.

Botany. *Gen. Char.*—Tube of the *calyx* cylindrical; limb four-partite. *Petals* four, adhering by their points in a sort of calyptra. *Stamens* distinct, arranged in four parcels, inserted in a quadrangular fleshy hollow near the teeth of the calyx. *Ovary* two-celled, each cell containing twenty ovules. *Berry*, when ripe, one- or two-celled, one- or two-seeded. *Seeds* cylindrical or semi-ovate: *cotyledons* thick, fleshy, concave externally, sinuous in various ways internally; *radicle* arising from the centre of the cotyledons, straight, superiorly hidden by the cotyledons.—*Trees.* *Leaves* opposite, coriaceous, dotted. *Cymes* terminal or in the forking of the branches; somewhat corymbose (D. C.)

Sp. Char.—*Leaves* ovate-oblong, acuminate at both ends. *Cymes* many-flowered (D. C.)

Fig. 199.

Caryophyllus aromaticus.

Trunk from 15 to 30 feet high. *Leaves* about four inches long, with a strong midrib and parallel lateral nerves; footstalks slender, aromatic; almost two inches long. *Flowers* odorous. *Calyx* at first green, afterwards purplish-red. *Petals* four, larger than the calyx, imbricated into a globe in bud, at length spreading, roundish, concave, yellowish-red, very soon caducous. In the centre of the calyx, and occupying the top of the ovary, is a quadrangular elevated line (or *gland*) surrounding, but not embracing the base of the shortish, obtusely subulate *style*. *Filaments* much longer than the petals, yellow: *anthers* ovate-cordate, yellow, two-celled. *Ovary* oblong, or almost cylindrical. *Berry* purplish, elliptical, one-seeded. *Seed* with a thin, soft integument; *embryo* elliptical, greenish, dotted.—(Condensed from *Bot. Mag.* t. 2749).

Hab.—Molucca Islands; where, as well as at Sumatra, Mauritius, Bourbon, Martinique, St. Vincent's, &c., it is now extensively cultivated. The short-sighted and selfish policy of the Dutch, to limit the cultivation of the plant to the Molucca Islands, has, therefore, completely failed. (See Marsden, *Hist. of Sumatra*, p. 146, 3rd ed.; Smith, in *Rees' Cyclo.* art. *Caryophyllus*; Crawford, *East. Archip.* iii. 388; Hooker, *Bot. Mag.* t. 2749).

Collection.—Cloves are collected by the hand, or beaten with reeds, so as to fall upon cloths placed under the tree, and dried by fire, or which is better, in the sun.

Commerce.—They are imported in casks or bags. Those produced in the Molucca Islands usually come by way of Rotterdam. In 18[illegible] duty (6d. per lb.) was paid on 93,549 lbs.

Description.—The clove of commerce (*caryophyllus*) is the unexpanded flower, the corolla forming a ball or sphere at the top, between the four teeth of the calyx, and thus with the tapering, somewhat quadrangular tube of the calyx, giving the appearance of a nail (whence the word *clove*, from the

French *clou*, a nail). The length of the clove is from five to ten lines; its thickness from one to one-and-a-half lines. Its colour is dark-brown with a yellowish-red tint; the corolla somewhat deeper. Good cloves should be dark-brown, and perfect in all parts, have a strong fragrant odour, and a hot acrid taste, and when slightly pressed with the nail, give out oil. They are distinguished in commerce by their place of growth. Those from the East Indies (*Amboyna* and *Bencoolen cloves*) are the best: they are the largest, plumpest, and most oily. The *Bencoolen clove* is the most esteemed. Cloves produced in the French possessions (*Bourbon* and *Cayenne cloves*) are smaller, more shrivelled, contain less oil, and are of inferior value. The *Cayenne clove* is the least esteemed.

Under the name of *Mother-cloves* (*matrices caryophylli* seu *anthophylli*) are described, in several authors, the fruits of the clove (*fructus caryophylli aromatici*) which have been occasionally introduced as articles of commerce, and a sample of which has been preserved in the collection of the East India House. They have the shape of an olive, than which they are smaller. Superiorly they are crowned with the four teeth of the calyx, with the remains of the style in the centre. Their colour is similar to that of the clove: their odour and flavour similar, but much weaker. Internally we find the embryo with its two sinuous cotyledons.

The broken peduncles of the clove (*clove-stalks; griffe de girofle*) are sometimes substituted by distillers for cloves (Guibourt).

Composition.—Cloves were analyzed by Trommsdorf (Gmelin, *Handb. d. Chem.* ii. 1272), who found them to consist of, *volatile oil* 18, *almost tasteless resin* 6, *peculiar kind of tannin* 13, *difficultly soluble extractive with tannin* 4, *gum* 13, *woody fibre* 28, and *water* 18.

1. *Volatile Oil of Cloves* (*Oleum Caryophylli*).—By distillation with water, cloves yield two volatile oils—one lighter, the other heavier than water. The oil of cloves of commerce is a mixture of these two oils. When carefully and recently prepared it is colourless or light-yellow, but by keeping becomes brownish-red. It has a hot, acrid taste, and the well-known odour of cloves, and is soluble in alcohol, ether, concentrated acetic acid, and the fixed oils. Its sp. gr. is probably variable, though always greater than that of water. Lewis found it to be 1·034. Bonastre (*Ann. de Chim. et Phys.* xxxv. 274) says, that of the unrectified oil is 1·055, but by rectification part of the light oil is lost, and the sp. gr. is then 1·061. Ettling (*Poggendorf's Annal.* xxxi. 526) says its composition is, *Carbon* 74·6279, *Hydrogen* 8·1531, and *Oxygen* 17·2189. To separate it into the two oils he mixed it with potash ley, and distilled: a *light oil* passed over, while a compound of the *heavy oil* (*clove acid*) and potash remained in the retort, and, by distillation with phosphoric or sulphuric acid, gives out the heavy oil.

a. Light Oil of Cloves (*Clove-Hydro-Carbon*).—Colourless. Sp. gr. 0·918. Incapable of combining with bases, but absorbing hydrochloric acid gas without yielding a crystalline compound. It consists of $C^{10} H^{8}$; hence it is isomeric with oil of turpentine (see p. 710).

β. Heavy Oil of Cloves (*Clove Acid; Eugenic Acid*).—It is colourless when recently prepared, but becomes coloured by age. Its sp. gr., according to Bonastre, is 1·079. It combines with alkalies to form crystalline salts (*alkaline eugenates; clove-oil alkalies*). If a salt of iron be added to one of these, it yields a blue, violet, or reddish compound (*a ferruginous eugenate*), varying somewhat according to the nature of the ferruginous salt used: thus the protosulphate of iron yields a lilac, the persulphate a red, which becomes violet and afterwards blue; while the sesquichloride gives a vinous, which turns to red (Bonastre). Nitric acid reddens clove acid.

The composition of clove acid is as follows:—

	Atoms.	*Eq. Wt.*	*Per Cent.*	*Ettling.*	*Boeckmann.*
Carbon	24	144	72·36	72·6327	72·696
Hydrogen	15	15	7·54	7·4374	7·434
Oxygen	5	40	20·10	19·9297	19·870
Clove Acid	1	199	100·00	99·9998	100·000

This statement does not agree with that of Dumas, who, from his first analysis (*Ann. de Chim. et Phys.* liii. 164), gave the formula $C^{20}\ H^{13}\ O^5$; and from his second one (*Pharm. Central-Blatt.* Oct. 13, 1838, from *Ann. der Pharm.* xxvii. 151), $C^{20}\ H^{12}\ O^5$. But various reasons, not necessary here to enumerate, lead me to believe that Ettling's formula is the correct one, supported as it is by Boeckmann's analysis and by Dumas's statement, that the sp. gr. of the vapour of clove acid is 6·4 (*Ibid:* also Thomson, *Org. Chem.* p. 1046).

2. *Eugenin* (*Stéaroptène of Oil of Cloves*).—This was found in oil of cloves by Bonastre. It is in thin, white, pearly scales, which become yellow by keeping. It is very soluble in alcohol and ether; has the odour and taste of cloves, but weaker, and is reddened by nitric acid. According to Dumas, its composition is *Carbon* 72·25, *Hydrogen* 7·64, and *Oxygen* 20·11; or $C^{20}\ H^{12}\ O^4$.

3. *Caryophyllin* (*Clove sub-resin*).—First described by Lodibert (*Journ. de Pharm.* xii. 101) and afterwards examined by Bonastre (*Ibid.* p. 103). It is extracted from cloves by alcohol. The Molucca cloves yield the largest quantity of it; those of Bourbon contain less; and the Cayenne cloves none. It is a satiny, crystalline, odourless, tasteless, fusible and volatile substance; insoluble in water, soluble in alcohol and ether; slightly so in caustic alkalies. It is reddened by sulphuric acid. According to Dumas (*Ann. de Chem. et Phys.* liii. 164) it is composed of *Carbon* 79·5, *Hydrogen* 10·5, *Oxygen* 10·0; hence its formula is $C^{20}\ H^{16}\ O^2$; so that its composition is similar to that of camphor (p. 791).

4. *Clove-tannin.*—The tannin of cloves is less acerb than ordinary tannin, and its compound with gelatin has less elasticity.

Chemical Characteristics.—Nitric acid reddens infusion of cloves. Tincture of sesquichloride of iron renders it blue. The oil of cloves also undergoes similar changes to the infusion. These facts deserve especial attention in relation to opium and morphia (see Opium) on account of the analogous phenomena presented by morphia when acted on by nitric and sesquichloride of iron (*Journ. de Pharm.* xi. 539 and 566). Infusion and oil of allspice are also similarly affected.

Physiological Effects.—Cloves have a very agreeable flavour and odour, and are devoid of the fiery taste and acridity which distinguish pepper and ginger: in other respects their effects agree with those of other spices (see p. 72). Though volatile oil is by far the most important of their active principles, yet the tannin, extractive, and resin, must contribute something to their operation.

Uses.—Cloves are principally used for culinary purposes, as flavouring ingredients. They are not employed in sufficient quantity to prove of much importance as condimentary stimulants, yet they are applicable as gastric excitants, in dyspeptic cases connected with relaxation of the alimentary canal. In medicine cloves are rarely employed alone, or as the basis or principal medicine, but usually as an addition to other medicines, the flavour of which they improve, or whose operation they correct. When, however, they are given alone, it is merely as a stomachic and carminative, to relieve nausea, vomiting, flatulence, or some allied stomach disorder. Distillers prepare a liqueur called *cloves*.

Administration.—In substance cloves may be taken in doses of five or ten grains, or *ad libitum*.

1. *Infusum Caryophylli*, L. E. *Infusum Caryophyllorum*, D. *Clove Tea.* (Cloves, bruised, ʒiij. [ʒj., *D.*]; Boiling [distilled, *L.*] Water, Oj. [Oss. wine meas. *D.*] Macerate for two hours in a vessel lightly covered, and strain [through calico, *E.*])—Aromatic, stimulant, and stomachic. Employed in dyspepsia, flatulent colic, gout, &c.; generally in combination with other medicines. Ammonia increases its efficacy. Dose, f℥j. to f℥ij.

2. *Oleum Caryophylli*, E. (Obtained by submitting cloves, wi

water, to repeated distillation).—No directions are given by the London and Dublin Colleges for the preparation of oil of cloves, which is placed by them among the articles of the Materia Medica.

To extract the whole of the oil from cloves, they must be subjected to repeated cohobations. On an average they yield from 17 to 22 per cent. of volatile oil (including the heavy and light oils). The physical and chemical properties of this oil have been already described (p. 1093). It is sometimes placed in the hollow of a carious tooth, to relieve toothache; but its more frequent medicinal use is as an addition to purgatives (e. g. *pilulæ colocynthidis*, E.) to check nausea and griping. The dose of it is two to six drops. Distillers and soap-makers extensively use oil of cloves.

3. *Tinctura Caryophylli.* (Cloves, ℥j.; Rectified Spirit, ℥iv. Macerate for seven days, and then filter).—Though not contained in any of the British pharmacopœias, this is a very useful and elegant preparation, and has a place in the French Codex. A solution of the oil in spirit is less agreeable, and becomes milky on the addition of water. Dose, ♏x. to f℥j. It may be usefully employed as an addition to purgative, stomachic, and tonic mixtures.

Euge'nia Pimen'ta, Decandolle, E.—*The Common Allspice.*

Myr'tus Pimen'ta, *Linn. L. D.*)

Sex. Syst. Icosandria, Monogynia.

(Baccæ immaturæ exsiccatæ, *L.*—Unripe berries, *E.*—Fructus, *D.*)

History.—It is scarcely probable that the ancients should have been acquainted with *allspice*, which is a native of the West Indies, and therefore could not have been known to Europeans before the discovery of America. Yet Clusius (*Exotic.* lib. i. cap. 17) thought it was the *garyophyllon* of Pliny (*Hist. Nat.* lib. xii. cap. 15, ed. Valp.), an opinion, however, which, for the above-mentioned reason, can scarcely be correct (Sloane's *Jamaica*, ii. 77).

Botany. *Gen. Char.*—Tube of the *calyx* roundish; limb divided, as far as the ovary, into four segments. *Petals* as many as the lobes. *Stamens* indefinite, free. *Ovary* two- or three-celled; cells containing many ovules: *Berry* nearly globose, crowned by the calyx; when ripe, one-, rarely two-celled. *Seeds* one to two, somewhat rounded, large; *embryo* spuriously monocotyledonous; *cotyledons* very thick, combined into one mass; *radicle* scarcely distinct, very short (D. C.)—*Trees* or shrubs.

Sp. Char.—*Peduncles* axillary and terminal, trichotomous-paniculate. *Flowers* four-cleft, in the forks of the peduncle, nearly sessile, others paniculate. *Leaves* oblong or oval, pellucid-dotted, somewhat opaque, smooth. *Branches* terete; branchlets compressed; the younger ones, as well as the pedicels, pubescent (D. C.)

Trunk about 30 feet high. *Leaves* about four inches long, on short foot-stalks. *Flowers* numerous. *Sepals* roundish. *Petals* reflected, greenish-white. *Berry* succulent, black or dark-purple when ripe; two-seeded. *Embryo* roundish, with the cotyledons consolidated.—(Condensed from *Botan. Mag.* t. 1236).

Hab.—West Indies. It is cultivated in Jamaica in regular walks (*Pimento walks*).

Collection.—When the fruit has attained its full size, but is yet green, it is gathered and sun-dried on platforms and sheets. When nearly dry it is frequently winnowed. It is afterwards put in bags of 100 cwt. each, for the European market (Wright, *Med. Plants of Jamaica;* Brown, *Nat. Hist. of Jamaica*, 248). Some planters kiln-dry it.

Description.—*Pimento* or *Jamaica pepper* (*pimenta* seu *piper jamaicense*) commonly called *allspice* (because its flavour is considered to approach that of cinnamon, cloves, and nutmegs) is about the size of, or somewhat larger than, a peppercorn. It is round, brown, dull, roughish but not wrinkled, crowned with the segments of the calyx, and occasionally, though rarely, has a short pedicel. It consists of an external, somewhat hard but brittle shell, which is paler within, and encloses two dark brown cochleate seeds. Allspice has an aromatic agreeable odour (intermediate between pepper and cloves) and a strong aromatic clove-like taste.

Ovate Pimento (*Brasilianischer* oder *Kron-Piment*, Dierbach, *Berlin. Jahrbuch*, Bd. xxxviii. s. 296; *Piment couronné* ou *Poivre de Thevet*, Guibourt, *Hist. des Drog.* iii. 351.)—This is the fruit of *Myrtus pimentoides*, Nees v. Esenbeck (*Icones Plant. Med.*) called by Decandolle (*Prodr.* iii. 243) *Myrcia pimentoides*, a native of the West Indies. Except in shape, it strongly resembles the common allspice. It is ovate or oval, terminated superiorly by a large crown, formed by the five-toothed limb of the calyx. It is usually two, more rarely three or four-celled, each cell containing one seed. Guibourt has always found three, four, or six seeds in each fruit. In the only sample I have seen, and which came from St. Vincent's, there were in most of the fruits only two seeds.

Commerce.—Pimento is imported in bags, usually from the West Indies (almost entirely from Jamaica). In 1839, duty (9*d.* per lb.) was paid on 277,185 lbs.

Composition.—Pimento was analysed by Braconnot (Duncan, *Edinb. Dispens.*) and in 1825 by Bonastre (*Journ. de Chim. Méd.* i. 210).

Bonastre's Analysis.

	Husks.	*Kernels.*
Volatile oil	10·0	5·0
Green oil	8·4	2·5
Solid fat oil	0·9	1·2
Astringent extract	11·4	39·8
Gummy extract	3·0	7·2
Colouring matter	4·0	......
Resinous matter	1·2	......
Uncrystallizable sugar	3·0	8·0
Malic or gallic acid	0·6	1.6
Lignin	50·0	......
Saline ashes	2·8	1·9
Water	3·5	3·0
Loss	1.6	1·8
Red matter, insoluble in water	......	8·8
Pellicular residue	......	16·0
Brown flocculi	......	3·2
Total	100·0	100.0

Braconnot's Analysis.

Volatile oil	1·9
Amylum	9·0
Wax, with red colouring matter	0·9
Gum	6·0
Nitrogenous matter	5·0
Citrate of Potash	6·0
Phosphate of Potash and loss	3·4
Insoluble matter	67·8
Total	100·0

1. *Volatile Oil of Pimento* (*Oleum Pimentæ*).—By distillation with water, allspice like cloves, yields two volatile oils, the one lighter, the other heavier than water. The oil of pimento of the shops is a mixture of these. Except in odour, its properties are almost identical with those of oil of cloves (see p. 1093). By distillation with

caustic potash, the *light oil* is separated; the residue, mixed with sulphuric acid and submitted to distillation, gives out the *heavy oil.*

α. *Light Oil of Pimento* (*Pimento-Hydro-Carbon*).—Has not, to my knowledge, been previously examined. Its properties appear to be similar to those of the light oil of cloves. It floats on water and on liquor potassæ, and is slightly reddened by nitric acid. Potassium sinks in, and is scarcely, if at all acted on by, it.

β. *Heavy Oil of Pimento* (*Pimentic Acid*).—Very similar to clove-acid. It forms with the alkalies, crystalline compounds (*alkaline pimentates*) which become blue or greenish on the addition of the tincture of chloride of iron (owing to the formation of a *ferruginous pimentate*). Nitric acid acts violently on and reddens it.

2. *Green Oil* or *Matter* (*Resin?*) This substance, which has an acrid burning taste, contributes to the activity of pimento. Its odour is rancid, but somewhat clove-like. It dissolves readily in alcohol and ether, to which it communicates a green colour.

3. *Pimento-tannin.*—Is soluble in alcohol, strikes a green colour with the persalts of iron, and precipitates emetic tartar.

Chemical Characteristics.—See *Chemical Characteristics* of oil of cloves, p. 1094.

Physiological Effects.—Allspice possesses the general properties of the species already noticed (p. 72). It holds an intermediate rank between pepper and cloves.

Uses.—Its principal employment is by the cook, for flavouring. It may be taken with advantage by those troubled with relaxed or atonic conditions of stomach. In medicine, its uses are similar to those of cloves; viz. to relieve flatulency, to cover the flavour of nauseous remedies, and to promote the operation of tonics and stomachics, and to prevent the griping of purgatives.

Administration.—In substance, allspice may be taken in doses of from ten grains to a drachm or more

1. *Oleum Pimentæ*, L. E. D. (Obtained by submitting allspice, bruised, with water, to distillation).—Allspice yields, I am informed by Mr. Whipple, about 4·37 per cent. of volatile oil (heavy and light together). Its medical uses are very limited. It is sometimes employed to relieve tooth-ache, to correct the operation of other medicines, as purgatives and tonics, and to prepare the *spiritus* and *aqua pimentæ*. The dose of it is from two to six drops.

2. *Spiritus Pimentæ*, L. E. D. (Pimento, bruised, ℥ijss. [℥iij. *D.*]; Proof Spirit, *Cong.* i.; Water, Oj. [sufficient to prevent empyreuma, *D.*] The *Edinburgh College* directs half a pound of bruised pimento to be used, and to proceed as for spirit of caraway [see p. 1035]).—Carminative and stomachic. Used in dyspepsia, and flatulent colic. Dose, f℥j. to f℥iv. In the shops, a spirituous solution of the oil is frequently substituted for the pharmacopœial preparation.

3. *Aqua Pimentæ*, L. E. D. (Pimento, bruised, lb. i. [lb. ss. *D.*; or Oil of Pimenta, ℥ij. *L.*]; [Proof Spirit, f℥vij. *L.*; Rectified Spirit, f℥iij. *E.*]; Water, *Cong.* ij. [sufficient to prevent empyreuma, *D.*] Mix, and let a gallon distil. The *Dublin College* macerates first for twenty hours.) —Carminative. Employed for its flavouring, carminative, and stomachic properties, as a vehicle for stimulant, tonic, and purgative medicines. Dose, f℥j. to f℥ij. In the shops, it is usually prepared with the oil.

Other Medicinal Myrtaceæ.

Fig. 200.

Eucalyptus resinifera.

The substance called *Botany Bay Kino* is the astringent inspissated juice of *Eucalyptus resinifera* or *Iron Bark*, a native of Australia and Van Diemen's Land. This tree, we are told (White, *Journ. of a Voyage to New South Wales*, p. 231, 1790), sometimes yields on incision sixty gallons of juice. Botany Bay kino is imported in boxes. That which I have met with came from Van Diemen's Island. It occurs in irregular odourless masses, many of which are in the form of tears, somewhat resembling those of cherry-tree gum in form, and as large as the tears of Senegal gum. The purer pieces are vitreous, almost black in the mass, but transparent, and of a beautiful ruby-red in small and thin fragments. Some of the pieces, however, are opaque and dull, from the intermixture of wood and other impurities. When chewed it sticks to the teeth, and has an astringent taste. Digested in cold water it swells, becomes soft and gelatinous (like red-currant jelly), and yields a red liquid which reddens litmus, and yields precipitates with lime water, gelatin, acetate of lead, sesquichloride of iron, and, if caustic potash or ammonia be previously added, with the chloride of calcium. Alcohol and emetic tartar occasion no precipitate. Digested in rectified spirit, Botany Bay kino becomes gelatinous, as with water, and yields a similar red solution, from which water precipitates nothing, but which reddens litmus, and deposits a copious precipitate when potash, ammonia, or lime-water is dropped in. From these and other experiments, I infer that Botany Bay kino consists principally of *pectin* and *tannic acid*. It has been used in diarrhœa (White, *op. cit.*) Ainslie (*Mat. Indica*) says it is the only kind employed in India; but I suspect there is some error in this statement.

Order 55. Lythraceæ, *Lindley*.—The Loosestrife Tribe.

Salicariæ, *Jussieu*.—Lythrarieæ, *Decandolle*.

Essential Character.—*Sepals* definite in number, coherent beyond the middle. *Calyx* free, tubular or campanulate; lobes valvate, or distant in æstivation; the sinuses being sometimes lengthened into conical lobes or external teeth. *Petals* inserted on the upper part of the tube of the calyx, between the lobes, various in number, sometimes none, generally very caducous. *Stamens* inserted into the tube of the calyx below the petals; equal, double, triple, or quadruple the number of petals, sometimes fewer. *Anthers* oval, bilocular, adnate. *Ovary* free; *style* filiform; *stigma* usually capitate. *Capsule* membranous, covered or surrounded by the calyx; of two to four carpels; while young generally (always?) two-celled by the slender margins of the carpels being inflexed; but when ripe one-celled by the disappearance of the dissepimenta, either dehiscing longitudinally, or more rarely and irregularly with a circumscissile dehiscence. *Placenta* central, adnate to the dissepiment when present, or free, thick, either compressed-cylindrical or obscurely trigonal or tetragonal; the apex with some threads, conveyers of the seminal aura, continuous with the base of the style. *Seeds* many, small, exalbuminous; *embryo* straight; *radicle* turned towards the hilum; *cotyledons* flat, foliaceous. (D. C.)

Properties.—Variable. Except *Lythrum Salicaria*, which is astringent, the medicinal properties of few species are well known. Nesæa salicifolia is said to be diuretic, diaphoretic, and purgative.

Lythrum Salicaria, Linn. D.—*Spiked Purple-Loosestrife.*

Sex. Syst. Dodecandria, Monogynia.

(Herba, *D.*)

History.—As this plant is a native of the Grecian Archipelago, it must have been known to the ancients; but hitherto it has not been satisfactorily identified with any plant described by them.

Botany. *Gen. Char.*—*Calyx* cylindrical, striated, toothed at the apex; teeth eight to twelve, of which four to six are broader than the rest, and erect, and the remaining four to six alternate ones, subulate, often horn-shaped, sometimes not present, or very small. *Petals* four to six, arising from the apex of the tube, alternate with the erect teeth. *Stamens* arising from the middle or base of the calyx, double or equal the number of the petals, or by abortion fewer. *Style* filiform; *stigma* capitate. *Capsule* oblong, covered by the calyx, two-celled, many-seeded. *Placentæ* thick, adhering to the dissepiment.—*Herbs*, or rarely *undershrubs*. *Leaves* entire. *Flowers* axillary, purple or white. (D. C.)

Sp. Char.—*Leaves* lanceolate, cordate at the base. *Flowers* spiked, almost sessile. (D. C.)

Stems two to three feet high, four-sided. *Spikes* very long. *Flowers* purple. *Petals* oblong, cuneiform. *Stamens* usually twelve, of which six are long and six short.

Hab.—Ditches and watery places of this and other countries of Europe, west of Asia, New Holland, and North America.

Description.—The herb (*Herba Salicariæ* seu *Lysimachiæ purpureæ*) when dry, is inodorous, but has an herbaceous, somewhat astringent taste, and by chewing becomes very mucilaginous. Its infusion is darkened by the ferruginous salts.

Composition.—I am unacquainted with any analysis of this plant. Its obvious constituents are *tannic acid*, *mucilage*, *chlorophylle*, and *woody fibre*.

Physiological Effects.—Demulcent and astringent.

Uses.—Principally employed in diarrhœa and dysentery. In the former of these complaints, it was recommended by Bang (*Act. Reg. Soc. Med. Havn.* vol. i. p. 100), De Haen (*Rat. Med.* iii. 196; and iv. 250, quoted by Murray, *App. Med.*) and others. In dysentery, it was spoken favourably of by Gardane (*Gazette de Santé*, 1773, p. 65, quoted by Murray) and others.

Administration.—Dose of the powdered herb ℨi. twice or thrice a day. A decoction of the root, prepared by boiling ℥j. of the root in Oj. of boiling water, may be taken in doses of fℨi. or fℨij.

Order 56. Granateæ, *Don.*—The Pomegranate Tribe.

Essential Character.—Tube of the *calyx* turbinate; limb five- or seven-cleft, coriaceous; lobes valvate by æstivation. *Petals* five or seven. *Stamens* indefinite; *filaments* free; *anthers* anteriorly two-celled, dehiscing by a double chink. *Style* filiform; *stigma* capitate, pimpled. *Fruit* large, spherical, crowned with the somewhat tubular limb of the calyx, coated with the tube of the calyx, indehiscent, unequally divided into two chambers by a horizontal diaphragm; the upper one five- or nine-celled, the lower one smaller, three-celled; the dissepiments of both membranous. *Placentæ* of the upper chamber fleshy, spreading from the sides to the centre; those of the lower chamber irregular processes from its base. *Seeds* innumerable, mixed with a pellucid somewhat crystalline pulp, exalbuminous; *em-*

bryo oblong: *radicle* short, straight; *cotyledons* foliaceous, spirally convoluted.—*Trees* or *shrubs*. *Leaves* deciduous, opposite, oblong, entire, without dots. *Flowers* scarlet. (D. C.)

PROPERTIES.—See *Punica Granatum*.

Pu'nica Grana'tum, Linn. L. E. D.—*The Common Pomegranate.*

Sex. Syst. Icosandria, Monogynia.

(Fructus cortex, *L.*—Root-bark, *E.*—Baccæ tunica exterior; Radicis cortex; Flores, *D.*)

HISTORY.—The pomegranate is repeatedly referred to in the Bible (*Numbers* xiii. 23; *Deut.* viii. 8, &c.) Homer (*Odyss.* vii. 120) also mentions it. The leaves, the flowers, and the fruit, were employed in medicine by the ancients (Dierbach, *Arzneim. d. Hippoc.* 90; Dioscorides, lib. i. cap. 151 to 154; Pliny, *Hist. Nat.* xxiii. 57).

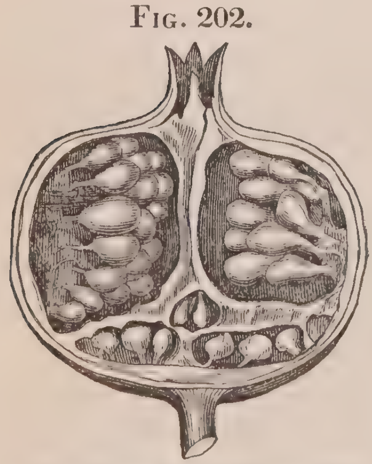
BOTANY. *GEN. CHAR.*—Only one genus (See the *characters* of the ORDER).

SP. CHAR.—*Leaves* lanceolate. *Stem* arborescent (D. C.)

FIG. 201.

Punica Granatum.

FIG. 202.



Section of the fruit of the Punica Granatum, shewing the two strata of cells.

Small *tree*, with a brownish bark. *Leaves* on short stalks, smooth. *Flowers* terminal on the young branches. *Calyx* thick, fleshy, red. *Petals* much crumpled, membranous, rich scarlet. *Stamina* numerous, inserted on the calyx; *anthers* yellow. *Ovary* roundish; *style* simple; *stigma* globular. *Fruit* larger than an orange, with a thick coriaceous rind, and crowned by the teeth of the calyx; cells several, arranged in two strata, one upper, the other lower, separated by a transverse diaphragm; lower stratum of three, upper one of from five to nine cells.—Some difficulty having been experienced in comprehending the structure of this anomalous fruit, Dr. Lindley (*Nat. Syst.* 2nd ed. p. 44, *Introd. to Bot.*) has explained it thus: within the calyx are two rows of carpella, a lower and inner one, consisting of three or four carpella surrounding the axis, and placed in the bottom of the calyx; and an upper and outer one, consisting of from five to ten carpella, surrounding the lower, but adherent to the upper part of the tube of the calyx. The two strata or tiers of cells in the pomegranate are formed by the two rows or tiers of carpella; the upper and outer row being forced to the top of the fruit by the contraction of the tube of the calyx from which they arise. The transverse diaphragm is formed by the adhesion of the upper to the lower stratum of carpella; and the outer part of the rind of the pomegranate is formed by the calyx which contains the carpella.

HAB.—Northern Africa, from whence it has been introduced into Europe, where it is now naturalized. Asia (Bengal, China, Persia).

DESCRIPTION.—The *flowers*, called *balaustine flowers* (*flores granati* seu *balaustiæ*), are odourless, of a fine red colour, and slightly styptic taste. They communicate a reddish colour to the saliva. The *rind of the fruit* (*cortex granati; malicorium*), when dry, occurs in irregular arched, dry, brittle, odourless, very astringent, and slightly bitter fragments, which are brownish (more or less yellow or reddish), and paler within. The *seeds* (*semina granati*) are each surrounded by a thin vesicle filled with an acidulous styptic juice. The *root* (*radix granati*) is woody, knotty, hard, heavy, of a yellow colour, and astringent taste. Its bark (*cortex radicis granati*) occurs in smallish fragments, of a yellowish- or ash-gray colour externally, yellow within, brittle, not fibrous; of an astringent, but not bitter taste. By its want of bitterness it may be disguished from the bark of the box-tree (*Buxus sempervirens*), which is said to be sometimes substituted for it. Moistened with water, and rubbed on paper, it leaves a yellow stain, which becomes deep-blue by the contact of sulphate of iron (Guibourt, *Hist. des Drog.* i. 501).

Composition.—Reuss (Gmelin, *Handb. d. Chem.* ii. 1272) examined the watery extract of the *rind of the fruit*. The *bark of the root* has been analysed by Wackenroder (*Ibid.*); in 1824 by Mitouart (*Journ. de Pharm.* x. 352), and, in 1831, by Latour de Trie (*Ibid.* xvii. 503-601).

Watery extract of Pomegranate Rind.		*Bark of the Pomegranate root.*		
REUSS'S ANALYSIS.		WACKENRODER'S ANALYSIS.		LATOUR DE TRIE'S ANALYSIS.
Resin	0·92	Rancid fat oil	2·46	Fatty matter.
Tannin	27·78	Tannin	21·92	Tannin.
Oxidized tannin	10·19	Starch with some		Gallic acid.
Extractive	21·76	mucilage of lime	26·09	*Granadin* (Mannite).
Gum	34·26	Woody fibre with		Resin (copious).
Loss	5·09	albumen	45·45	Wax.
		Loss	4·08	Chlorophylle.
				[Insoluble matters].
Extract of the rind	100·00	Dried bark	100·00	Bark of the root.

1. *Mannite* (*Granadin*).—The sweet substance which Latour de Trie considered to be peculiar, and called *granadin*, has been satisfactorily shown (*Journ. de Pharm.* xxi. 169) to be mannite (described at p. 930).

2. *Tannic acid.*—On this the astringency of the fruit and root almost solely depends. It is this principle which enables the infusion, or decoction, of the rind and bark to produce precipitates (*tannates*) with a solution of gelatin, and with the ferruginous salts.

3. *Resin.*—Latour de Trie describes this as being without any remarkable odour and taste. It is insoluble in water, slightly so in cold alcohol, and more so in hot alcohol, and in small quantity in ether.

Physiological Effects.—All parts of the plant (root-bark, rind of the fruit, juice surrounding the seeds, and flowers) possess astringency, owing principally to tannic acid, and in some slight degree to a minute quantity of gallic acid. The bark of the root, taken *in small quantities*, occasions no remarkable effects. *In full doses*, however, it causes nausea, vomiting, and purging, and occasionally giddiness and faintness.

Uses.—Rarely employed in medicine. The *root-bark* has been occasionally used as a vermifuge. Celsus, Dioscorides, Pliny, and other ancient writers, speak of its anthelmintic qualities. The Indians, also, were acquainted with them at a very early period. Of late years attention has been again drawn to this bark as a remedy for tape-worm, by the recommendations of Dr. Fleming (*Asiatic Researches*, vol. xi.), Dr.

Buchanan (*Ed. Med. and Surg. Journ.* vol. iii. 22), Mr. Breton (*Med. Chir. Trans.* vol. xi. p. 301), Gomes (*Journ. Complém. des Scienc. Méd.* xvi. 24), Deslandes, and others (Bayle, *Bibl. de Thérap.* i. 313); but in this country it has been almost entirely superseded by oil of turpentine. The *rind of the fruit* has been employed, on account of its astringency, in the form of decoction, as a gargle, in relaxed sore throat; as an injection, in leucorrhœa; and, internally, in diarrhœa, dysentery, and colliquative sweats. The powder of the rind may be administered as a tonic. The *flowers* are mild astringents, but are not employed in this country. The *fruit* may be eaten to allay thirst, and as a refreshing refrigerant and astringent in febrile disorders, especially those called bilious. It contains an acidulous styptic juice, which is inclosed in a thin vesicle surrounding the seeds.

ADMINISTRATION.—The *root-bark* is given in decoction. This is prepared by boiling ℥ij. of the fresh bruised bark in Oij. of water to Oj.: the dose is a wine-glassful every half hour till the whole is taken. It usually occasions slight sickness, but seldom fails to destroy the worm. The patient should be prepared for the remedy by the use of a dose of castor oil and a strict regimen the day previously. The *rind of the fruit* may be given, as an astringent and tonic, in doses of ʒss. to ʒj.

ORDER 57. ROSACEÆ, *Jussieu*.—THE ROSE TRIBE.

ESSENTIAL CHARACTER.—*Calyx* generally of five sepals, cohering at the base to form a tube; therefore five-lobed, generally persistent, usually free, sometimes adherent to the ovary. *Petals* as many as the sepals, rarely by abortion none, inserted on the calyx, quincuncial in æstivation, generally regular. *Stamens* inserted with the petals, mostly indefinite; *filaments* incurved in æstivation; *anthers* two-celled, dehiscing by a double chink. *Carpels* numerous, either solitary by abortion, or having the appearance of a single ovary, from their union, either together or with the tube of the calyx. *Ovaries* one-celled; *styles* simple, dilated at the apex into *stigmas* of variable shape, usually arising from the side of the ovary, either distinct, or, more rarely, coherent. *Seeds* in each carpel usually one or two, seldom numerous; erect or inverse, exalbuminous (Hirtella and Neillia excepted). *Embryo* straight; *cotyledons* either foliaceous or fleshy.—*Herbs*, *shrubs*, or *trees*. *Leaves* alternate, bistipulate at the base, simple or compound. *Inflorescence* various (D. C.)

PROPERTIES.—The prevailing quality of Rosaceæ is astringency. This is especially obvious in the root. The tribe Amygdaleæ is distinguished from other rosaceous plants by the poisonous properties of the kernels and leaves, which yield hydrocyanic acid when distilled with water, and by the gummy exudation from the stems.

TRIBE I.—*AMYGDALEÆ*.

Amyg'dalus commu'nis, Linn. L. E. D.—*Common Almond*.

Sex. Syst. Icosandria, Monogynia.

(*Var. α.* Nuclei. Amygdala amara. *Var. β.* Nuclei. Amygdala dulcis. Oleum ab alterutriusque nucleis expressum, *L.*—*Var. α.* Kernel; Bitter almond. *Var. β* and *γ.* Kernel; Sweet almond, *E.*—Nuclei; Amygdalæ amaræ. Amygdalæ dulces, *D.*)

HISTORY.—Almonds were well known to the ancients. They are mentioned in the earliest part of the Old Testament (*Genesis*, xliii. 11). Hippocrates employed both sweet and bitter almonds, and their expressed oil, in medicine (*Opera*, pp. 484, 669, and 413). Dioscorides (lib. i. cap. 39) describes the mode of expressing the oil.

BOTANY. *GEN. CHAR.*—*Drupe* pubescent, velvety; with a fibrous, juiceless cortex, which falls off irregularly; *putamen* (shell) pitted or smooth. *Young leaves* folded flat (conduplicate). *Flowers* somewhat sessile, solitary or in pairs, earlier than the leaves, arising from scaly buds. *Fruit* woolly (D. C.)

SP. CHAR.—*Leaves* oblong-lanceolate, serrulate. *Flowers* solitary. *Calyx* campanulate. *Fruit* ovoid-compressed, tomentose (D. C.)

A small *tree*. *Leaves* on glandular footstalks, acuminate. *Flowers* moderately large, rose-red or white, nearly sessile, appearing before the leaves. *Calyx* reddish, campanulate, five-cleft; the segments blunt. *Petals* five, ovate, irregularly notched, rose-red. *Stamens* numerous (about thirty), shorter than the petals, inserted into the mouth of the calyx. *Ovarium* woolly; *style* simple; *stigma* round. *Drupe* ovoid, compressed, leathery, marked with a longitudinal furrow, where it opens when ripe; *epicarp* greenish-gray, tomentose; *mesocarp* (or sarcocarp) fibrous, cracking and dropping off; *endocarp* (*putamen*) woody or almost osseous, oblong or ovate, acute, marked with pits or furrows. *Seed* one (rarely two) in each drupe.

Decandolle (*Prodr.* ii. 530) admits five varieties of this species:—

α. *amara*. *Bitter Almond.*—*Styles* almost as long as the stamens, tomentose below. *Seeds* bitter.—*Flowers* larger; *petals* white, roseate at the base. It varies with a hard and brittle *putamen*.

β. *dulcis*. *Sweet Almond.*—*Leaves* ash-green. *Flowers* earlier. *Styles* much longer than the stamens. *Fruit* ovate-compressed, acuminate. *Seeds* sweet. *Putamen* hard.

γ. *fragilis*. *Tender-shelled.*—*Flowers* coetaneous. *Petals* broader, quite emarginate. *Leaves* shorter; petioles thick. *Fruit* acuminate, sweet. *Putamen* soft.—*Flowers* somewhat roseate.

δ. *macrocarpa*. *Large-fruited.*—*Leaves* broader, acuminate, scarcely ash-coloured. *Peduncles* shorter, turgid. *Fruit* larger, umbilicated, acuminate at the apex. *Putamen* hard.—*Flowers* white-roseate, large, appearing before the leaves. *Petals* broadly obcordate, undulate. It varies—1st. with a lesser fruit called the *Sultana Almond;* 2ndly, with a very small fruit termed the *Pistachio Almond.*

ε. *persicoïdes*. *Peach Almond.*—*Leaves* like those of the peach. *Fruit* oval, obtuse. *Sarcocarp* succulent. *Putamen* yellowish-black. *Seeds* sweet.—On the same branch the *fruit* is sometimes ovate, obtuse, and somewhat fleshy; and dry, ovate-compressed, and acuminate.

HAB.—Barbary and Syria. Cultivated in the southern parts of Europe.

DESCRIPTION.—*Almonds in the shell* (*Amygdalæ cum putamine*) consist of the seed, or kernel (*Amygdala*), enclosed in the endocarp (*putamen* or *shell*), which may be hard or soft. The seed is of an oval shape, compressed, rounded at one end, and somewhat pointed at the other. The outer covering of the seed (*epidermis seminalis*, Bichoff) is glanduliferous, bitter, of a reddish-brown colour, and veined by the ramifications of the *raphe*. At the pointed extremity of the seed is a small perforation (*foramen*), and on one side of this, at the edge, is the rugged line (*hilum*) which constitutes, botanically, the *base* of the seed. The seed is connected, at the hilum, with the shell by the *umbilical cord*. The large or round end of the almond is curiously enough termed its apex. That part of the internal seed-coat (*endopleura*, Decandolle) which corresponds to the blunt or rounded end of the almond, is dark-coloured, indicating the situation of the *chalaza*. By soaking almonds in warm water, the seed-coats (pellicle or skin) are easily removed. *Blanched almonds*

FIG. 203.

Section of an almond.
a. One of the cotyledons.
b. Radicle and plumule.

(*amygdalæ decorticatæ*) consist of the *embryo* only, composed of the two large fleshy *cotyledons*, between which, at the pointed extremity of the seed, we observe the *plumule*, with the *radicle* pointing towards the foramen (see fig. 203).

1. Sweet Almonds (*Amygdalæ dulces*).—These are odourless, and have a bland, sweetish, agreeable taste. Three varieties are known in commerce:—" 1. *Jordan almonds*, which are the finest, come from Malaga. Of these there are two kinds; the one above an inch in length, flat, and with a clear brown cuticle, sweet, mucilaginous, and rather tough; the other more plump and pointed at one end, brittle, but equally sweet with the former.—2. *Valentia almonds* are about three-eighths of an inch broad, not quite an inch long, round at one end and obtusely-pointed at the other; flat, of a dingy-brown colour, and dusty cuticle.—3. *Barbary* and *Italian almonds* resemble the latter, but are generally smaller, and less flattened. Rancid, worm-eaten, and broken almonds should be rejected" (Brande, *Dict. of Pharm.* 55). Sweet almonds are rarely employed for pressing, on account of their greater cost, and the less value of the residual *almond cake* (*placenta amygdalæ dulcis*). *Almond powder* (*farina amygdalæ*) is the ground almond cake, and is employed as a soap for washing the hands, and as a lute.

2. Bitter Almonds (*Amygdalæ amaræ*).—These are brought chiefly from Mogadore. In external appearance they resemble the sweet almond, but are somewhat smaller. They are distinguished by their bitter flavour, and, when rubbed with a little water, remarkable odour. They are extensively used for pressing. Their *cake* (*placenta amygdalæ amaræ*) is distilled with water to yield the *volatile oil of bitter almonds*, and is afterwards employed to fatten pigs, and for other purposes.

Commerce.—The following table shows the quantity of almonds (bitter and sweet) on which duty was paid during the last two years (*Trade List*):—

	Duty per cwt.	Quantity on which duty was paid. In 1839.	In 1838.
Jordan	40s.	1596	1098
Not Jordan	20s.	3576	2200
Bitter	4s.	2145	1870

Almonds are imported in barrels, serons, boxes, bales, &c.

Composition.—*Sweet almonds* have been analysed by Proust (Gmelin, *Handb. d. Chem.*); in 1817 by Boullay (*Ibid.* vi. 406), and in 1825 by Payen and Henry fils (*Journ. de Chim. Méd.* i. 436).—*Bitter almonds* were analysed by Vogel (Gmelin, *Hand. d. Chem.* ii. 1268).

Boullay's Analysis.

Fixed oil	54·0
Emulsion	24·0
Liquid sugar	6·0
Gum	3·0
Seed-coats	5·0
Woody fibre	4·0
Water	3·5
Acetic acid and loss	0·5
Sweet almonds	100·0

Vogel's Analysis.

Volatile oil and hydrocyanic acid	*Quantity undeterm^d.*
Fixed oil	28·0
Emulsion	30·0
Liquid sugar	6·5
Gum	3·0
Seed-coats	8·5
Woody fibre	5·0
Loss	19·0
Bitter almonds	100·0

1. *Fixed* or *Expressed Oil of Almonds* (*Oleum Amygdalæ*).—Obtained by expression from either sweet or bitter almonds, but usually from the latter, on account of their

cheapness, as well as of the value of the cake which they yield. When recently expressed it is turbid, but by rest and filtration becomes quite transparent. It usually possesses a slightly-yellow tinge, which becomes somewhat paler by exposure to solar light. It is inodorous, or nearly so, and has a purely oleaginous bland taste. It congeals less readily by cold than olive oil. Braconnot states, that at 14° F. it deposits 24 per cent. of *margarin*, which fuses at 43° F. The residual *elain* did not congeal at the greatest degree of cold. The accuracy of these statements has, however, been called in question. Its sp. gr. would appear to vary: Brandis found it 0·911, Brisson 0 917, Saussure 0·920, at 53°6 F. Sulphuric ether dissolves it. Six parts of boiling, or twenty-five parts of cold alcohol, are required to dissolve one part of this oil.

Proximate Composition. BRACONNOT.		*Ultimate Analysis.* SAUSSURE.	
Elain	76	Carbon	77·403
Margarin (Stearin of Braconnot)	24	Hydrogen	11·481
		Oxygen	10·828
		Nitrogen [loss]	0·288
Almond oil	100	Almond Oil	100·000

The nitrogen mentioned in Saussure's analysis is probably an error.

2. *Emulsin* (*Vegetable Albumen of Almonds*).—This remarkable constituent of almonds is white, and soluble in cold water: hence it is a constituent of almond emulsion. From its watery solution it is precipitated in thick white flocks by alcohol; these flocks dissolve in water, even if they have been previously dried. If the watery solution be heated to 212° F. the emulsin coagulates, and the liquor becomes thick, like starch mucilage. From ordinary vegetable albumen, emulsin is distinguished by its producing the decomposition of amygdalin, and yielding, among other products, the volatile oil of bitter almonds and hydrocyanic acid. When, however, emulsin has been coagulated by heat, it loses its power of acting on amygdalin (Wöhler and Liebig, *Journ. de Pharm.* xxxiii. 391). The composition of emulsin, according to Mr. Richardson (Thomson, *Organ. Chemistry*, 683), is as follows:—

	Atoms.	*Eq. Wt.*	*Per cent.*	*Richardson.*
Carbon	24	144	48·81	48·835
Hydrogen	23	23	7 79	7·732
Nitrogen	4	56	18·99	18·911
Oxygen	9	72	24·41	24·722
Emulsin	1	295	100·00	100·200

Boiled with baryta, emulsin evolves ammonia, and yields a barytic salt containing a peculiar acid, which has been termed *emulsic acid.* It is probable, therefore, that emulsin is *an amide of emulsic acid* (i. e. emulsate of ammonia, minus an atom of water). Robiquet (*Journ. de Pharm.* xxiv. 196) regards the emulsin of Wöhler and Liebig as a very complex product.

3. *Amygdalin.*—A crystallizable substance found in the bitter, but not in the sweet almond. It is a probable constituent of cherry-laurel leaves. From four lbs. of bitter almonds Liebig obtained one ounce of pure amygdalin (*Handwört. d. Chem.* p. 330). It is white, odourless, has at first a sweet, then a bitter taste, is very soluble in boiling alcohol and in water, but is insoluble in ether. Crystallized out of an alcoholic solution it is in pearly scales, and is anhydrous. The crystals obtained from a watery solution are colourless, transparent, and prismatic, and contain six atoms of water of crystallization. The watery solution has a feebly bitter taste. Submitted to distillation with nitric acid, it yields hydrocyanic acid, oil of bitter almonds, formic acid, and some benzoic acid. Heated with an alkaline solution it evolves ammonia, and yields an alkaline salt, which contains a peculiar acid, called *amygdalic acid*, composed of $C^{40} H^{26} O^{24}$; hence, perhaps, amygdalin is *an amide of amygdalic acid* (i. e. an amygdalate of ammonia, minus an atom of water). By the action of a solution of emulsin on a solution of amygdalin, we obtain, among other products, hydrocyanic a id and the volatile oil of bitter almonds (see *Volatile Oil of Bitter Almonds*). The following is the composition of amygdalin, according to Wöhler and Liebig (*op. cit.*; also *Journ. de Pharm.* xxiii.)

	Atoms.	Eq. Wt.	Per cent.
Carbon	40	240	52·516
Hydrogen	27	27	5·908
Nitrogen	1	14	3·064
Oxygen	22	176	38·512
Amygdalin	1	457	100·000

In the crystallized state it consists of, 1 atom of *Amygdalin* = 457, and 6 atoms of *Water* = 54.

4. *Volatile* or *Essential Oil of Bitter Almonds* (*Oleum Amygdalæ amaræ destillatum; Essentia Amygdalæ*).—Obtained by submitting bitter almond cake (left after the expression of the fixed oil from bitter almonds) to distillation with water, either alone, or more usually with salt. To increase the quantity of volatile oil, Geiger recommended the cake to be macerated in the water for twenty-four hours before distillation.

The *theory* of this process is curious. Chemists formerly supposed that the volatile oil resided in the bitter almond, and that by distillation it was merely volatilized, and subsequently condensed. But in opposition to this view may be urged the following facts:—

1. Neither bitter almonds, nor their residuary cake, yield any volatile oil by pressure; yet we know that the volatile oil is soluble in the fixed oil, and, therefore, when the latter was expressed it ought to contain traces of the volatile oil, if this existed in bitter almonds.

2. They yield no oil when digested in alcohol or in ether, though the volatile oil is soluble in both of these liquids.

3. Alcohol extracts from bitter almond cake, sugar, resin, and amygdalin. When the latter substance has been removed, the cake is no longer capable of furnishing the volatile oil by distillation.

4. Ether extracts no amygdalin from bitter almond cake; and the cake left after digestion in ether, yields the volatile oil by distillation with water.

These facts, then, prove that the volatile oil does not reside in the bitter almond, but is formed by the action of water on some of the constituents of these seeds. Now, when bitter almonds are deprived of amygdalin, they are incapable of yielding the volatile oil: so that it is this principle which enables them to yield it. But amygdalin, with water only, produces no oil: hence the presence of some other substance is necessary. Wöhler and Liebig (*Journ de Pharm.* xxiii.) have shown that this other substance is emulsin, and that, by the mutual reaction of amygdalin, emulsin, and water, we obtain the volatile oil of bitter almonds and hydrocyanic acid. But it appears that sugar, and some other substance (probably a compound of formic acid and altered emulsin) are simultaneously developed. These ingredients are, probably, all yielded by the amygdalin, the operation of emulsin on which must, therefore, be analogous to that of yeast on sugar and water. It will be seen by the following table (drawn up by Wöhler and Liebig), that amygdalin contains the elements of hydrocyanic acid, volatile oil of bitter almonds, sugar, formic acid, and water:—

	Atoms of Carbon	Hydrogen	Nitrogen	Oxygen.
1 atom of Hydrocyanic acid	2	1	1	0
2 atoms Volatile Oil of Bitter Almds.	28	12	0	4
1 atom of Sugar	6	5	0	5
2 atoms of Formic acid	4	2	0	6
7 atoms of Water	0	7	0	7
1 atom of Amygdalin	40	27	1	22

The essential oil of bitter almonds of the shops possesses the following properties:—It is highly poisonous, has a golden-yellow colour (by rectification it may be rendered temporarily colourless), an agreeable odour (usually compared to that of hydrocyanic acid, but which, in fact, bears but little resemblance to it), and an acrid, bitter, taste. It is combustible, and burns with a white flame. Its sp. gr., though always greater than that of water, probably varies somewhat. I find that a sample, which had been prepared for about eight months, had the sp. gr. 1·0836. It is soluble in alcohol and ether. Oil of vitriol gives it a fine crimson-red colour. The presence of hydrocyanic acid in bitter almonds may be readily detected by the usual tests, especially by potash and a salt of iron (see p. 240). The quantity of this acid is differently stated by different authorities, and is, probably, not uniform. Schrader (quoted by Dr. Christison, *Treat. on Poisons*) got, from an old sample, 8·5 per cent., and from a new sample, 10·75; but Göppert obtained, from another specimen, so much as 14·33 per cent. Water in which the oil has been washed gives evidence of the presence of hydrocyanic acid by the potash and iron test before referred to.

A *crystalline matter* is frequently deposited by oil of bitter almonds, when it has been kept for some time. Exposure to the air, by which the oil is enabled to absorb oxygen, facilitates, if, indeed, it do not always cause, the deposition. In 1822, Grischow and Bahlmann (*Berl. Jahrb. d. Pharm.* 1822, p. 158), and, in 1823, Stange (*Buchner's Repert.* xiv. 329; xvi. 82) declared the crystals to be those of benzoic acid (described at p. 937); a statement which was confirmed, in 1830, by Robiquet and Boutron (*Ann. de Chim. et de Phys.* xliv. 364). I have met with three kinds of crystalline deposit, differing essentially from each other, and from benzoic acid. 1st. One of these is characterised by the *emerald-green* colour which it produces when dropped into oil of vitriol. In a few minutes, however, the green changes to red. This deposit is orange-yellow, soluble in boiling water, alcohol, and ether: when the alcoholic or etherial solutions cool, numerous white, light, pearly crystalline plates (resembling crystallized boracic acid) are deposited. If these crystals be boiled in caustic potash, ammonia is evolved. It appears then to be an *amide;* but it does not precisely agree either with *benzamide* or *benzimide* (*bibenzamide*).—2nd. A second crystalline deposit is characterized by the *cherry-red* colour which it assumes when dropped into oil of vitriol, and by its not evolving ammonia when boiled with caustic potash. Its appearance resembles solid oil of anise. When dissolved in boiling alcohol and re-crystallized, it yields silky prismatic crystals, somewhat similar to those of nitrates of ammonia.—3rd. The third* kind of deposit I did not receive until after it had been digested in alcohol. A short notice of it has been given by Mr. Letheby (*Lond. Med. Gaz.* xxvi. 67). The crystals are small, acicular, and lemon-yellow; they dissolve in oil of vitriol, forming a *yellow* or *orange-coloured* solution. They are insoluble in water and alcohol. When heated they fuse, but, unlike the two preceding deposits, do not sublime. They do not evolve ammonia when heated with a solution of caustic potash.

By distilling the oil of bitter almonds with caustic potash and a ferruginous salt, it may be deprived of hydrocyanic acid. It is then a limpid, colourless oil, having a sp. gr. of 1·043, and whose odour and taste are scarcely different to those of the ordinary oil. Robiquet found it innocuous, but Vogel declared that it still retained its poisonous properties. In some earlier experiments which I made on this subject, I found the rectified oil highly poisonous, though I could not detect an atom of hydrocyanic acid in it. After the sample had been kept a few months, however, I readily detected the acid in it by the potash and iron test. By a second and third rectification I have completely deprived it of all traces of the acid; and I then found that four drops of it, given to a small rabbit, had no more effect than the same quantity of any other volatile oil: that is, the animal appeared dull for a few minutes, and the respiration was quickened. The rectified oil is composed of $C^{14} H^6 O^2$. Now, certain changes which it undergoes are best explained by assuming that this oil is a compound of the base of benzoic acid and hydrogen. To this base, whose composition is $C^{14} H^5 O^2$, the name of *benzule* or *benzoyl* has been given; so that the oil is the *hydruret of benzule*, and its proximate and ultimate composition are as follow:—

Proximate Composition.

	Atoms.	Eq. Wt.
Benzule	1	105
Hydrogen	1	1
Hydruret of Benzule	1	106

Ultimate Composition.

	Atoms.	Eq. Wt.	Per cent.
Carbon	14	84	79·24
Hydrogen	6	6	5·66
Oxygen	2	16	15·10
	1	106	100·00

* For samples of this, as well as of the first kind of deposit, I am indebted to Mr. Whipple.

The following table explains the composition of *benzule* and some of its compounds:—

Benzule		$C^{14}\ H^{5}\ O^{2}$
Hydruret of Benzule	Oil of Bitter Almonds	$C^{14}\ H^{5}\ O^{2}$ + H.
	Benzoïne	$C^{14}\ H^{5}\ O^{2}$ + H.
Oxide of Benzule (Benzoic acid)		$C^{14}\ H^{5}\ O^{2}$ + O.
Chloride of Benzule		$C^{14}\ H^{5}\ O^{2}$ + Chl.
Bromide of Benzule		$C^{14}\ H^{5}\ O^{2}$ + Br.
Iodide of Benzule		$C^{14}\ H^{5}\ O^{2}$ + Iod.
Sulphuret of Benzule		$C^{14}\ H^{5}\ O^{2}$ + S.
Cyanide of Benzule		$C^{14}\ H^{5}\ O^{2}$ + C^{2} N.

Benzoïne, shown above to be isomeric with oil of bitter almonds, is obtained by mixing oil of bitter almonds with caustic potash, and exposing for some weeks to the air. It is a crystalline substance, and has been called *camphoride*, or *the camphor of oil of bitter almonds*. The conversion of oil of bitter almonds into *benzoic acid* will be readily understood by reference to the above table. One equivalent of the oil, and two equivalents of atmospheric oxygen, yield one equivalent of benzoic acid and two equivalents of water. *Chloride* and *bromide of benzule* are obtained by the action, respectively, of chlorine and bromine on oil of bitter almonds. *Iodide*, *sulphuret*, and *cyanide of benzule*, are procured by the action of chloride of benzule on iodide of potassium, sulphuret of lead, and cyanide of mercury, respectively.

Benzamide, composed of $C^{14}\ H^{7}\ N^{1}\ O^{2}$ (or benzoate of ammonia, minus an atom of water), is obtained by passing ammoniacal gas through chloride of benzule. *Benzimide* or *bibenzamide*, composed of $C^{28}\ H^{11}\ N^{1}\ O^{4}$ (or bibenzoate of ammonia, minus two atoms of water), was extracted by Laurent from a resinous substance, obtained by E. Laugier, by distilling oil of bitter almonds. Both of these *amides* evolve ammonia, and are converted into benzoate of potash when boiled with a solution of caustic potash.

Physiological Effects, Uses, and Administration.—I. Of Sweet Almonds. 1. Effects.—Sweet almonds are nutritive and emollient; but on account of the quantity of oil which they contain, they are somewhat difficult of digestion, at least if taken in large quantities, or by persons whose digestive powers are weak. When rancid they are still more apt to disorder the stomach. The husk or pellicle of the almond has been known to occasion nausea, uneasiness in the stomach and bowels, increased heat, œdematous swelling of the face, followed by urticaria. Dr. Winterbottom (*Med. Facts and Observ.* vol. v. p. 60) suffered twice in this way from the use of unblanched sweet almonds, but blanched almonds caused no inconvenience. *Almond emulsion* agrees in many of its properties with animal milk. Thus it is white; when examined by the microscope is seen to consist of myriads of oleaginous globules, suspended in water by the aid of an albuminous principle (emulsin) and sugar; and, lastly, it agrees with milk, in possessing nutritive and emollient qualities. *Almond oil* possesses the dietetical and medicinal qualities of olive and other fixed oils (see pp. 926-7). Thus its *local action* is emollient (see p. 82): swallowed in *moderate doses* it is nutritive, but difficult of digestion; in *large doses* it operates as a mild laxative.

2. Uses.—For *dietetical* purposes, almonds are employed as a dessert, for puddings, cakes, &c. On account of the irritant qualities of the husk, almonds for the table should always be blanched. Blanched and roasted they have been used as a substitute for coffee (Murray, *App. Med.* iii. 25). *Medicinally* they are used in the preparation of the *confection*, *emulsion*, and *oil*.

1. *Confectio Amygdalæ*, L. *Conserva Amygdalarum*, E.; *Con-*

fectio Amygdalarum, D. (Sweet Almonds, ℥viij.; Powder of Gum Arabic, ℥j.; Sugar, ℥iv. The almonds being first macerated in cold water, and their pellicles removed, beat all the ingredients until thoroughly incorporated.—The process of the *Dublin College* is essentially the same.—The *London College* adds, that this confection can be preserved unaltered for a longer time, if the almonds, gum arabic, and sugar, are separately powdered, and afterwards mixed. Then, whenever the confection is to be used, beat all the ingredients together until they are thoroughly incorporated).—Almond confection, prepared without water, is not more apt to spoil or become rancid than when the ingredients are separately powdered, and subsequently mixed; but if, in order to soften the mass, a little water be added, it then soon becomes mouldy or rancid, or both (Brande, *Dict. of Pharm.* 56). The only use of almond confection is in the preparation of the emulsion.

2. *Mistura Amygdalæ*, L. *Mistura Amygdalarum*, E. D. *Almond Emulsion: Almond Milk.* (Almond Confection, ℥iiss.; Distilled Water, Oj. Gradually add the water to the confection, while rubbing, until they are mixed; then strain through linen, *L.*—The *Edinburgh College* employs ʒij. of the Confection to Oij. of Water, and strains the mixture through linen or calico; or they direct it to be prepared by the following process: "Sweet Almonds, ℥j. and ʒij.; Pure Sugar, ʒv.; Mucilage, fʒss.; Water, Oij. Steep the almonds in hot water and peel them, and proceed as for the *Mistura Acaciæ*."—The *Dublin College* prepares it as follows: Sweet Almonds, blanched, ℥iss.; Bitter Almonds, ℈ij.; Refined Sugar, ʒss.; Water, Oiiss. Rub the almonds with the sugar, adding gradually the water; then strain.)—Notwithstanding that the formulæ of the three Colleges are different, none of them precisely agree with that which is in common use. No one who wishes to procure good almond milk would prepare it with the confection, on account of the changes which this preparation suffers by being kept. Powdered gum arabic is, for ordinary purposes, a more convenient and ready ingredient than mucilage, and does not undergo any change by keeping. Lastly, the emulsion containing bitter almonds, though agreeable to most persons, and perhaps useful in some cases, is not applicable to all the purposes for which the ordinary emulsion is employed, and is apt to disagree with some individuals. The following formula yields a preparation identical with that of the London College: Sweet Almonds, ʒiv.; Powdered Gum Arabic, ʒj.; White Sugar, ʒij.; Water, fʒvjss. Having blanched the almonds, beat them with the sugar and gum, the water being gradually added.—Almond milk is used as a demulcent and emollient in pulmonary affections, to appease cough and allay irritation; and in inflammatory affections of the alimentary canal or of the urinary organs. It is an excellent vehicle for other remedies; as for the saline refrigerants (nitre, for example) in febrile cases, for expectorants and paregorics (squills, ipecacuanha, opiates, &c.) in pulmonary affections, for sudorifics (emetic tartar, for example) in febrile and inflammatory cases, for alkalies and their carbonates in affections of the urino-genital organs, and for hydrocyanic acid in gastrodynia and pulmonary disorders. Acids and alcohol (hence tinctures) coagulate the emulsin, and cause almond mixture to separate into a kind of curd and whey; a change which also takes place spontaneously when the mixture has been kept, and which is accompanied with the development of free

acid. In cases where the hydrocyanic acid is admissible (see p. 246), the bitter almond may be used, as in the formula of the Dublin College. The dose of almond emulsion is f℥j. or f℥ij., or *ad libitum.*

3. *Oleum Amygdalæ*, L. *Oleum Amygdalarum*, D.; *Almond Oil.* (Obtained by expression from bitter or sweet almonds).—The average produce of almond oil from bitter or sweet almonds is from 48 to 52 lbs. *per cwt.* (*Private information*).—The physical and chemical properties of almond oil have been already described. Gingilie or Teal oil (oil of the seeds of *Sesamum orientale*) is, I am informed, occasionally substituted for almond oil. By cold it more readily deposits margarin than almond oil.

Fig. 204.

Sesamum orientale.

The *Sesamum orientale* (*Nat. Ord.* Pedaliaceæ; *Sex Syst.* Didynamia, Angiospermia) is a native of India. It is an annual, of about two feet high. The seeds are imported from Calcutta under the name of *teel seeds* (*till* Hindooie). They are flat, cordate, and about the size of white mustard seed. In Eastern countries they are used for dietetical purposes (Ainslie, *Mat. Ind.* ii. 255). By expression they yield a fixed oil (*gingilie oil*), which may be used as a substitute for almond oil.

Almond oil may be employed for the same purposes as olive oil (see p. 927). Mixed with an equal volume of syrup of violets, or syrup of roses, it is given to new-born infants as a laxative. It is sometimes used with gum (in the form of mucilage), alkalies, or yolk of egg, to form an emulsion, which is used in the same cases as the *mistura amygdalæ*. To assist in allaying troublesome cough it is not unfrequently administered in the form of linctus, with confection of dog-rose, syrup of poppies, &c.

II. Of Bitter Almonds. 1. Effects. (*a.*) *On Animals generally.*—Bitter almonds are more or less poisonous to all classes of animals. As in the cases of other poisonous vegetable substances, the larger herbivora are much less powerfully affected by them. Thus, three quarters of a pound of bitter almonds, given to a horse, caused merely dulness and a small pulse (Viborg, quoted by Wibmer, *Wirk. d. Arzneim. ü. Gifte*, i. 157). One drachm of bitter almonds has killed some of the smaller animals, as pigeons (Wepfer, *Hist. Cicut. aquat.* p. 298, Lugd. 1733). Twenty seeds have killed a small robust dog (Orfila, *Toxicol. Gén.*) The symptoms which they induce in animals, are, trembling, weakness, palsy, convulsions (often of the tetanic kind), and, finally, coma. If vomiting occur early, the animal in that way may escape.

(*b.*) *On man.*—*In small doses* bitter almonds sometimes act as irritants to the digestive organs, and occasion nausea, vomiting, and purging. Owing to idiosyncrasy, some individuals are remarkably affected by them. On the late Dr. Gregory they caused, "first, sickness, generally tremors, then vomiting, next a hot fit, with an eruption of urticaria, particularly on the upper part of the body. At the same time the face and head swelled very much, and there was a general feeling like intoxication. The symptoms lasted only a few hours. The rash did not alternately appear and disappear, as in common nettle-rash" (Christison). *In large doses* bitter almonds have caused serious, or even fatal consequences.

Pierer (quoted by Wibmer, *op. supra cit.*) mentions that three children having eaten some of these seeds, were attacked in a few minutes with nausea, vomiting, loss of consciousness and of speech, and convulsions. Mr. Kennedy (*Lond. Med. and Phys. Journ.* lvii. 150) has noticed the case of a stout labourer, who died after the use of a great quantity of bitter almonds. These, and other observations referred to by Wibmer (*op. supra cit.*), Coullon (*Recherches*, &c. *sur l'acide Hydrocyan.* 1819), and others, prove that the poisonous effects of the bitter almond are similar to those of hydrocyanic acid (see p. 241).

The *volatile oil of bitter almonds* is a most potent poison, acting as rapidly as the ordinary hydrocyanic acid of the shops, and giving rise to similar symptoms. A single drop has killed a cat in five minutes (Brodie, *Phil. Trans.* 1811, p. 178). Sir B. Brodie happening to touch his tongue with a probe which had been dipped in the oil, suffered, almost instantaneously, an indescribable sensation at the pit of the stomach, feebleness of limbs, and loss of power over the muscles. These effects, however, were quite transient. Several cases of poisoning with it are recorded. The best detailed is that related by Mertzdoff (quoted by Dr. Christison): —"A hypochondriacal gentleman, 48 years old, swallowed two drachms of the essential oil. A few minutes afterwards, his servant, whom he sent for, found him lying in bed, with his features spasmodically contracted, his eyes fixed, staring, and turned upwards, and his chest heaving convulsively and hurriedly. A physician, who entered the room twenty minutes after the draught had been taken, found him quite insensible, the pupils immoveable, the breathing stertorous and slow, the pulse feeble, and only thirty in a minute, and the breathing exhaling strongly the odour of bitter almonds. Death ensued ten minutes afterwards." Another case of poisoning with this oil occurred a few years since in Aldersgate-street:—A lady, intending to take beech-nut oil, for worms, swallowed (by mistake) oil of bitter almonds, sold to her by a druggist, who supposed she inquired for peach-nut oil. Recovery has occurred, in one case, after about half an ounce (?) of the oil had been swallowed (*Journ. Chim. Méd.* t. vi. IIe Sér. p. 92).

The *distilled water of bitter almonds* (*aqua amygdalæ amaræ*) possesses poisonous properties, when either swallowed or applied externally (see Döltz's experiments, in Wibmer, *op. supra cit.*) Sömmering states that half an ounce of concentrated bitter almond-water killed a dog (Buchner, *Toxikolog.*)

The *emulsion of bitter almonds* partakes of the properties of the seeds. Pouzaire (quoted by Wibmer) states that a child of between four and five years of age suffered colic, head affection, grinding of the teeth, trismus, insensibility, and death, from the use of a strong dose of this liquid.

Macaroons and *Ratafia* cakes, as well as *Noyau*, which owe their peculiar flavour to bitter almonds, may act injuriously when taken in large quantities (see Virey, *Journ. de Pharm.* ii. 204, for the ill effects of the first of these).

2. Uses.—The principal consumption of the bitter almond is for flavouring and scenting. For the former purpose the seeds, or their essential oil, are used by the cook and confectioner; but the employment of the oil requires the greatest caution, as it is, at least, four times as strong as

the strongest commercial prussic acid. The oil is extensively employed for scenting soap, and for other purposes of the perfumer.

By the medical practitioners in this country, bitter almonds are rarely administered. They sometimes enter into the composition of the almond emulsion (see *Mistura Amygdalarum*, Ph. D.), but usually as a flavouring ingredient only. They are applicable, however, to all the uses of hydrocyanic acid (see p. 246); as pulmonary affections, gastrodynia, hooping-cough, &c.; but the objection to their use is their varying and uncertain strength. Bergius (*Mat. Med.* i. 433), and subsequently Frank, Hufeland (Richter, *Ausf. Arzneim.* ii. 541-2), and others, have successfully administered them against intermittent fever. They have also been used to expel tape-worm, and, it is said, with good effect (Hufeland's *Journ.* Bd. xi. St. 4, S. 179). Pitschaft (Dierbach, *Neuest. Entd. in d. Mat. Med.* Bd. i. 387. 1837) prescribed bitter almond-water to relieve painful menstruation. The emulsion has been employed as a wash to relieve irritation in various skin diseases; as herpes, prurigo, acne, impetigo, &c.

Administration.—Bitter almonds may be taken in substance or emulsion. Kranichfeld (Dierbach, *op. supra cit.*) employed *the powder of the bitter almond cake (farina amygdalæ amaræ)* in doses of one to six grs. *The volatile oil of bitter almonds (oleum volatile amygdalæ amaræ)* may be administered in doses of a quarter of a drop to a drop and a half, in an emulsion. Its strength is somewhat variable, but in general it is at least four times that of the officinal hydrocyanic acid. *The essence of bitter almonds* (prepared by dissolving f℥ij. of the volatile oil in f℥vj. of rectified spirit) is generally used by cooks, and others, for flavouring. As a substitute for *the distilled water of bitter almonds (aqua amygdalæ amaræ)*, which is of variable strength, Wöhler and Liebig (*Journ. de Pharm.* xxiii. 415) recommend the following emulsion (*emulsio amygdalæ cum amygdalinâ*) on account of its uniform strength:—Sweet Almonds, ℨij.; Water, and Sugar sufficient to make f℥j. of emulsion, in which, when strained, dissolve Amygdaline, grs. xvij. This quantity of amygdalin, when acted upon by the emulsion, yields one grain of anhydrous hydrocyanic acid and eight grains of volatile oil. The dose of this emulsion is gtt. x. to f℥j. *Almond paste* is sold in the shops for softening the skin and preventing chaps. Dr. Paris (*Pharmacol.*) gives the following recipe for making it:—Bitter Almonds, blanched, ℥iv.; the white of an Egg; Rose Water and Rectified Spirit, p. æ., as much as may be sufficient.

Per'sica vulga'ris, Miller.—*The Peach.*

Amyg'dalus Per'sica, *Linn. D.*

Sex. Syst. Icosandria, Monogynia.

(Folia, *D.*)

History.—Both Dioscorides (lib. i. cap. 164) and Pliny (*Hist. Nat.* lib. xv. cap. 11, et seq. ed. Valp.) speak of the peach: the former terms it περσικὸν μῆλον; the latter *malum persicum*.

Botany. *Gen. Char.*—The same as *Amygdalus*, except that the *drupe* is very fleshy. *Epicarp* either velvety or quite smooth. *Putamen* (stone) extremely rugose, with furrows (D. C.)

Sp. Char.—*Fruit* tomentose (D. C.)

Fig. 205.

The Peach.

A small *tree*. *Leaves* lanceolate, serrate or crenate, with or without glands. *Flowers* roseate, large or small (see Loudon, *Ency. of Gardening*). Both flowers and kernels exhale the bitter-almond odour.

Two varieties of the peach are usually made. These are admitted by Decandolle:—

α. *Melters* or *Free-stones*.—Flesh separating from the stone.

β. *Cling-stones* or *Pavies*.—Flesh adherent to the stone.

The *Nectarine* (*Persica lævis*, Decand.) is distinguished from the Peach by its smooth fruit. This trivial distinction leads many botanists to regard them as varieties of the same species.

Hab.—Native of Persia. Cultivated in gardens. Flowers in April or May.

Description.—*Peach leaves* (*folia persicæ*) have the peculiar odour and taste of the bitter almond. The *kernels* (*semina persicæ*) closely resemble the latter, both in appearance and properties, but are smaller. The *flowers* (*flores persicæ*) lose the greater part of their odour by drying.

Composition.—The *leaves* have not been analyzed. They yield, by distillation, a volatile oil (*oleum folii persicæ*), which is yellow, heavier than water, and contains hydrocyanic acid (Gmelin, *Handb. d. Chem.* ii. 400). After eight years a crystalline substance was found on the water (Brugnatelli, *Ann. Chim.* xcvi. 96). The non-ligneous extremities of the *twigs* of the peach-tree yielded Gauthier (*Journ. de Pharm.* xiii. 549) 1·92 per cent. of very energetic volatile oil, which was heavier than water. Berard (Thomson, *Org. Chem.* 890) analyzed the juice of the peach, both in the ripe and unripe states: the constituents were, *colouring matter*, *sugar*, *gum*, *vegetable fibre*, *albumen*, *malic acid*, *lime*, and *water*.

Physiological Effects.—The highly palatable *flesh* of the peach is nutritious (on account of its sugar, gum, &c.), and slightly refrigerant (from the free malic acid which it contains). Taken in moderate quantity it is wholesome, but if eaten too freely is apt to disorder the bowels. The *kernels*, the *blossoms*, the *leaves*, and the *bark*, possess poisonous properties. The flowers, as well as the leaves, in the form of infusion, have been used to purge and destroy intestinal worms, especially in children (Coste et Willemet, quoted by Murray, *App. Med.* iii. 245); but their employment has sometimes been attended with fatal results. Bertrand (Wibmer, *Wirk. d. Arzneim. ü. Gifte.* Bd. iv. S. 190) says, that a child, eighteen months old, experienced convulsions, vomiting, and bloody diarrhœa, from the use of a strong decoction of the flowers; and Coullon (Christison, *Treat. on Poisons*, p. 726) states, that an elderly gentleman, having partaken of a salad of the flowers, was seized with giddiness, violent purging, convulsions, and stupor, and died in three days. The irritation of the alimentary canal, manifested by vomiting and purging, and the slow death, distinguish the operation of peach-flowers from that of hydrocyanic acid. The same author (Wibmer, *op. supra cit.*) also states, that the peach-bark proved injurious to a cock, and caused difficulty of breathing, and purging.

Uses.—The *fruit*, both fresh and preserved, is employed as a dessert. Its use is objectionable in gouty persons, and in those whose bowels are easily disordered. When stewed with sugar, it may be given as a mild laxative to convalescents. The *kernels* may be used as the bitter almond. The *blossoms* are scarcely ever administered in this country; but they have been recommended as a vermifuge. The *leaves* are sometimes employed by the cook and liqueur-maker, for flavouring. They have also been used as a substitute for China-tea (Murray, *App. Med.*) They have been recommended as a vermifuge, and more recently to allay irritation of the bladder and urethra.

Administration.—The dose of *peach-blossoms* is half an ounce of the fresh, or a drachm of the dried, flowers, infused in water (Murray, *op. supra cit.*) The dose of the *infusion of peach-leaves* (prepared by digesting ℥ss. of the dried leaves in Oj. of boiling water) is f℥ss. three times a day.

Pru'nus domes'tica, Linn. L. E. D.—*The Plum-Tree.*

Sex. Syst. Icosandria, Monogynia.

(Drupæ exsiccatæ, *L.*—Dried fruit, *E.*—Fructus siccatus, *D.*)

History.—Dioscorides (lib. i. cap. 174) calls this tree the *κοκκυμηλέα*, while the fruit he terms *κοκκύμηλον*.

Botany. *Gen. Char.*—*Drupe* ovate or oblong, fleshy, quite smooth, covered with a pruinose powder. *Putamen* (stone) compressed, acute on both sides, somewhat furrowed at the edges, otherwise smooth. Young *leaves* convolute. *Pedicels* umbellato-fasciculate, one-flowered, evolved before or after the leaves (D. C.)

Sp. Char.—*Flowers* almost solitary. *Leaves* lanceolate-ovate, convolute. *Branches* not spinous (D. C.)—A small *tree*. *Flowers* white.

Gardeners admit several hundred varieties (270, Don. *Syst. of Gard.* ii. 499). Decandolle admits the following varieties:—

α. *Armenioïdes*, including the *Mirabelle Plum.*
β. *Claudiana*, including the *Green Gage.*
γ. *Myrobalana*, including the *Myrobalan Plum.*
δ. *Damascena*, including the *Damask Plum.*
ε. *Turonensis*, including the *Orleans Plum.*
ζ. *Juliana*, yields the *Officinal Prune.*
η. *Catherinea*, including the *St. Catharine Plum.*
θ. *Aubertiana*, including the *Magnum Bonum*, or *Mogul Plum.*
ι. *Prunealina*, including the *Damson.*

Hab.—South of Europe. Cultivated in gardens and orchards.

Description.—The dried fruits of the *Prunus domestica* are called *prunes* (*fructus siccatus pruni; drupæ siccatæ pruni*). In warm countries they are dried on hurdles by solar heat; but in colder climates, artificial heat is employed. In France both methods are adopted; the fruit being exposed to the heat of an oven and to that of the sun, on alternate days. *Table prunes* are prepared from the larger kinds of plum—as the Saint Catherine and the Reine-Claude (Green Gage): *Medicinal prunes* from the Saint Julien (*P. domestica*, var. ζ *Juliana*). The former have an agreeable, very sweet, taste; the latter are somewhat austere. They are principally imported from Bourdeaux. The part employed in medicine is the *pulp* (*pulpa pruni*).

Composition.—John (Gmelin, *Handb. d. Chem.* ii. 1269) analyzed the Mirabelle Plum, and Berard the Reine-Claude (Green Gage), both in the ripe and unripe states (Thomson, *Org. Chem.* 890). The constituents of the ripe fruit, according to the last-mentioned chemist, are, *sugar* 11·61, *gum* 4·85, *albumen* 0·93, *malic acid* 1·10, *vegetable fibre* 1·21, *lime* a trace, *water* 80·24, [loss 0·06].—*Pectin* is also a constituent of these fruits.

Physiological Effects.—Fresh ripe plums, taken in moderate quantities, are wholesome and nutritive; but in large quantities they readily disorder the bowels. The immature fruit still more easily excites ill effects. The medicinal prune is a mild laxative.

Uses.—The finer kinds of plums are employed at the table as a delicious dessert: the inferior qualities are used in pies, tarts, conserves, and sweetmeats. The larger prunes are also employed at the table as a dessert. The medicinal prunes are employed as an agreeable and mild laxative for children, and during convalescence from febrile and inflammatory disorders. They are sometimes added to cathartic decoctions or infusions (as *infusion of senna*), to improve the flavour, and promote the purgative effect. They enter into the composition of the *confection of senna.*

Cer'asus Lauro-cer'asus, Loisel.—*Common* or *Cherry-Laurel.*

Pru'nus Lauro-cer'asus, *Linn. D.*

Sex. Syst. Icosandria, Monogynia.

History. — Belonius terms this plant the *Cerasus trapezuntina* (Sprengel, *Hist. Rei Herb.* i. 377). It was introduced into Europe, from Trebisonde, in 1576.

Botany. *Gen. Char.*—*Drupe* globose or umbilicate at the base, fleshy, quite smooth, not covered with a pruinose powder. *Nucleus* (stone) somewhat globose, smooth.—Young *leaves* conduplicate. *Pedicels* one-flowered or ramose (D. C.)

Sp. Char.—*Racemes* shorter than the leaves. *Leaves* ovate-lanceolate, remotely serrate, with two to four glands beneath. *Fruit* ovate, acute (D. C.)

An evergreen *under-shrub.* Smooth in every part. *Leaves* short-stalked, coriaceous, shining. *Petals* roundish, spreading white. *Fruit* black, the size of a small cherry.

Hab.—Trebizonde. Common in gardens everywhere.

Description.—Cherry-laurel leaves *(folia lauro-cerasi)* have scarcely any odour until bruised, when they give out the characteristic or bitter almond odour of the plant. Their taste is very bitter, aromatic, and slightly astringent. By drying they lose their odour, but retain their flavour. Their watery infusion is rendered green by the sesquichloride of iron.

Composition.—I am unacquainted with any complete analysis of cherry-laurel leaves. They were imperfectly examined in 1797 by L. J. Spandaw du Celliée (Pfaff, *Mat. Med.* Bd. v. S. 152). In 1802, Schrader (*Ibid.* S. 151) discovered hydrocyanic acid in the volatile oil obtained from them. The recent researches into the origin of the volatile oil of the bitter almond (see p. 1106), render it probable that the volatile oil of the cherry-laurel does not pre-exist in the leaves. The supposed constituents of cherry-laurel leaves are *amygdalin* (probable, according to Wöhler and Liebig, though they failed to procure it), *resin* (Spandaw), *myricin* (the shining appearance of the leaves is, perhaps, owing to this), *chlorophylle* or green colouring matter, *extractive*, *tannic acid*, *ligneous fibre*, and *water*.

Volatile Oil of the Cherry-Laurel (Oleum Lauro-cerasi).—By distillation with water, cherry-laurel leaves yield a volatile oil and a distilled water *(aqua lauro-cerasi)*. As the oil, like the volatile oil of bitter almonds, contains both hydrocyanic acid and hydruret of benzule, it is natural to suppose that the two oils are produced in a similar manner. And though they did not succeed in procuring amygdalin, yet MM. Wöhler and Liebig (*Journ. de Pharm.* xxiii. 411) think its presence in cherry-laurel leaves highly probable; but what substance effects its decomposition has not yet been ascertained.

Cherry-laurel oil is pale yellow, and heavier than water. It attracts oxygen from the air, and deposits benzoic acid. Oil of vitriol colours it red. It contains hydrocyanic acid, which may be detected by an alkali and a ferruginous salt (see p. 240). The quantity, according to Schrader, is 7·66 per cent.; but Göppert declares it to be only 2·75 per cent. (Christison, *On Poisons*, p. 722). It appears, therefore, to be a weaker poison than the oil of bitter almonds, with which, according to Robiquet (*Journ. de Pharm.* viii. 304), it agrees in all its chemical properties.

Physiological Effects.—Most parts of the plant, but more especially the leaves and seeds, possess poisonous properties.

(*a*). *On Vegetables.*—The distilled water of the cherry-laurel destroys plants, like hydrocyanic acid. Göppert asserts, that its poisonous operation does not depend on the small quantity of this acid which it contains, but on some poisonous quality peculiar to it; for its activity is greater than that of water containing the same quantity of hydrocyanic acid (Decandolle, *Phys. Vég.* 1358-9).

(*b*.) *On Animals.*—The effects of cherry-laurel water on animals have been examined by a considerable number of observers (see Wibmer, *Wirk. d. Arzneim.* Bd. ii. S. 81). Of these it will be sufficient to mention the names of Madden (*Phil. Trans.* for 1731), Browne Langrish (*Phys. Exp. upon Brutes*, &c. 1746), Fontana (*Treat. on the Venom of the Viper*, &c. 1787), and Orfila (*Toxicol. Gén.*) It appears, says Dr. Christison, that whether cherry-laurel water is introduced into the stomach or into the anus, or into the cellular tissue, or directly into a vein, it occasions giddiness, palsy, insensibility, convulsions, coma, and speedy death;—that the tetanic state brought on by the pure acid is not always so distinctly caused by cherry-laurel water; and that tetanus is most frequently induced by medium doses (Christison, *op. cit.* p. 723). Cherry-laurel oil acts on animals as a powerful poison in the dose of a few drops; the symptoms which it excites being similar, if, indeed, they be not identical, with those induced by the volatile oil of bitter almonds (see p. 1111).

(*c*.) *On Man.*—Liqueurs, sweetmeats, creams, and puddings, flavoured with the cherry-laurel, have oftentimes acted injuriously, and even proved fatal. Where death occurred, the symptoms were similar to those caused by hydrocyanic acid; viz. painful sensation at the stomach, sudden insensibility, and death within a few minutes. Convulsions, however, have not been frequent. In the cases referred to by Dr. Madden (*Phil. Trans.* for 1731), in which brandy, mixed with a fourth part of cherry-laurel water, proved fatal, there was no vomiting, purging, or convulsions. But in the instances mentioned by Fodéré (Orfila, *Toxicol. Gén.*), the individuals expired in convulsions. The effects of medicinal doses of cherry-laurel water are stated to be similar to those of small doses of hydrocyanic acid.

Uses.—Cherry-laurel leaves are not unfrequently employed by the cook for flavouring. Though the distilled water of the cherry-laurel is contained in the Dublin Pharmacopœia, yet it is scarcely ever, I believe, employed in medicine in this country. It is applicable to all the cases for which hydrocyanic acid has been used (see p. 246). It has been used as a sedative narcotic in tic-douloureux, phthisis pulmonalis, spasmodic cough, and in palpitations of the heart.

Aqua Lauro-Cerasi, D. *Water of Cherry-Laurel. Laurel Water.* (Fresh Leaves of the Cherry-Laurel, lbj.; Water, Oiij. Distil a pint, and add an ounce of Compound Spirit of Lavender, instead of Rectified Spirit).—The compound spirit of lavender is added, as a colouring ingredient, to prevent the preparation being mistaken for common water. Dose f℥ss. to f℥j. The strength, and, therefore, the dose, is, however, liable to considerable variation. Fouquier (Richard, *Elém. d'Hist. Nat.* ii. 447) has, in some cases, given twelve ounces during the day, without any evident effect.

Tribe II.—*Dryadeæ.*

Ge um urba'num, Linn. D.—*Common Avens. Herb Bennet.*

Sex. Syst. Icosandria, Polygynia.

(Radix, *D*).

History.—Pliny (*Hist. Nat.* xxvi. 21. ed. Valp.) speaks of the medicinal properties of Geum.

Botany. *Gen. Char.*—Tube of the *calyx* concave; limb five-cleft, externally five-bracteolate. *Petals* five. *Stamens* numerous. *Carpels* juiceless, tailed, disposed in a head. *Style*, after flowering, articulate or barbed. *Seed* ascending.—*Herbs. Leaves* variously pinnatisect (D. C.)

Sp. Char.—*Stem* erect, branched, hairy. *Leaves* radical quinate-pinnatisect; caulinar ones ternate-palmatisect, with ovate broadly toothed-crenate lobes; upper ones one-lobed, ovate. *Stipules* somewhat orbicular, large. *Petals* obovate, as long as the calyx. Carpillary *head* spherical. *Ovaries* hairy, numerous. *Styles* smooth, with somewhat hairy appendices (D. C.)

Root of many brown fibres. *Stem* one or two feet high. *Leaves* grass-green, veiny, hairy. *Flowers* terminal, solitary. *Petals* bright-yellow.

Hab.—Indigenous. Growing in woods, hedges, and dry shady places.

Description.—The root (*radix carophyllatæ*, seu *gei urbani*, vel *sanamundæ*) consists of a rootstock of from one to three inches long, from which issue a considerable number of cylindrical fibres. Externally it is brownish; internally, reddish. When recent its odour is aromatic and clove-like; but this is greatly diminished by drying. Its taste is aromatic, astringent, and bitterish. It should be gathered in the spring.

Composition.—The root has been the subject of repeated chemi[cal] experiment. Thus it was examined by Muehlenstedt (Murray, [App.] *Med.* iii. 123), Anjou (*Ibid.*), Bouillon-Lagrange (*Ann. de Chim.* liv.), Melandri and Moretti (*Bull. de Pharm.* ii. 358), and Trommsdorf (*Mat. Med.* vi. 255). The latter chemist found the constituents dried root to be as follows:—*volatile oil* 0·039, *resin* 4, *tannin* soluble in alcohol and water 10, *tannin* insoluble in alcohol and ether, with traces of *chlorides*, 31, *gum* 15·8, *bassorin* 9·2, *ligneous fibre* 30 [excess 0·039].

PHYSIOLOGICAL EFFECTS.—Aromatic, tonic, and astringent.

USES.—Scarcely employed as a medicine in this country. It has been used in chronic diarrhœa and dysentery, leucorrhœa, chronic hemorrhages, and intermittents. It is put into ale, to communicate an agreeable clover-like flavour, and to prevent the liquor turning sour. Infused in wine it has been used as a stomachic.

ADMINISTRATION.—Dose ʒss. to ʒj., in powder or decoction, three or four times a day.

Potentil'la Tormentil'la, Sibthorpe, L. E.—*Common Tormentil*, or *Septfoil.*

Tormentilla officinalis, *Smith, D.*—Tormentilla erecta, *Linn.*

Sex. Syst. Icosandria, Polygynia.

(Radix, *L.*—Root, *E.*)

HISTORY.—Sprengel (*Hist. Rei Herb.* i. 43, 93, and 176) considers this plant to be the πεντάφυλλον of Hippocrates, Theophrastus, and Dioscorides. But Sibthorpe (*Prodr. Fl. Græcæ*, i. 352) considers the latter plant to have been the *Potentilla reptans.*

BOTANY. *GEN. CHAR.*—Tube of the *calyx* concave; limb four- or five-cleft, externally four- or five-bracteolate. *Petals* four or five. *Stamens* numerous. *Carpels* numerous. *Style* lateral. *Receptacle* procumbent, persistent, juiceless, capitate. *Seed* appended.—*Herbs* or *under-shrubs. Leaves* compound. *Stipules* adnate to the petioles. *Flowers* white, yellow, rarely red (D. C.)

SP. CHAR.—Multiform, hairy. *Root* tuberous. *Stem* ascending, dichotomous. *Leaves* ternate-palmatisect, the caulinar ones sessile; lobes obovate-wedge-shaped, more or less deeply toothed. *Stipules* none or three-toothed. *Flowers* axillary, solitary, with long peduncles. *Bracts* palmate-incised. Segments of the *calyx* lanceolate-linear, as long as the corolla. *Carpels* rugose. *Receptacles* villose (D. C.)

Stems weak, slender, often procumbent, branched. *Leaves* dark-green, somewhat hairy, especially the veins. *Flowers* bright-yellow.

HAB.—Indigenous; growing on barren pastures, heaths, and bushy places.

DESCRIPTION.—The root *(radix tormentillæ)* is large, compared with the size of the plant. Its external form is very irregular: sometimes it is more or less cylindrical, at others tuberculated and knobby. Its colour externally is dark red-brown, internally flesh-red or brownish. Its taste is astringent. Its watery infusion is coloured blackish-green *(tannate of iron)* by the sesquichloride of iron. A solution of gelatine causes a precipitate *(tannate of gelatine)* in it. By iodine, starch is detected in the root.

COMPOSITION.—Neumann (*Works* by Lewis, p. 362) and Pfaff (*Mat. Med.* ii. 210) submitted tormentilla root to a chemical investigation. Meissner (Gmelin, *Handb. d. Chem.* ii. 1269-70) made an analysis of it, and found the constituents to be as follows:—*volatile oil* a trace, *tannin* [illegible], *colouring matter* 18·05, *ditto* altered 2·57, *resin* 0·42, *cerin* 0·51, [illegible]*in* 0·20, *gummy extractive* 4·32, *gum* (pectin?) 28·20, *extractive* [illegible] *woody fibre* 15·0, and *water* 6·45 (excess 0·82).

Physiological Effects.—Astringent and tonic (see pp. 79-80).

Uses.—Employed in chronic diarrhœa and dysentery, passive hemorrhages, and intermittents. The decoction is also used as an astringent wash and injection; as in flabby ulcers, leucorrhœa, &c. In the dysenteries of cattle it is reputed efficacious. In the Feroe and Orkney islands it is used to tan leather; in Lapland as a red dye.

Administration.—Dose ʒss. to ʒj., in powder or decoction, three or four times a day.

Decoctum Tormentillæ, L. (Tormentil, bruised, ℥ij.; Distilled Water, Oiss. Boil down to a pint, and strain).—Astringent and tonic. Used internally in chronic diarrhœa. Dose, fʒj. to fʒij. Sometimes employed as an injection in leucorrhœa.

Tribe III.—*Roseæ*.

Ro'sa cani'na, Linn. L. E. D.—*Common Dog-Rose.*

Sex. Syst. Icosandria, Polygynia.

(Fructûs Pulpa, *L.*—Hip of R. canina, and of several allied species, *E.*—Fructus, *D.*)

History.—The κυνόροδον, or *Dog-Rose*, of Hippocrates (*Opera*, p. 587, ed. Fœs.) is, perhaps, *Rosa canina*, Linn., which, according to Sibthorp (*Prod.Fl. Græc.* i. 349), is a native of Greece. Pliny (*Hist. Nat.* lib. xxv. cap. 6, ed. Valp.) speaks of *Rosa sylvestris*, which he says is called *cynorrhodon* (i. e. *Dog-rose*); but as he describes the *sponge* as growing on it, he probably referred to *Rosa rubiginosa* (*Sweet Briar*, or *Eglantine*), on which it is more frequently found than on any other species.

Botany. *Gen. Char.*—Apex of the tube of the *calyx* contracted; the limb five-parted; segments during æstivation somewhat spirally imbricated at the apex, often pinnatisect. *Petals* five. *Stamens* numerous. *Carpels* many, inserted on the calyx, subsequently baccate, inclosed within the calyx, dry, indehiscent, somewhat crustaceous, bearing the style on the inner side. *Styles* exserted from the narrowed tube of the calyx, free or aggregated into a columnar style. *Seed* in an akenium, solitary, exalbuminous, inverted; *embryo* straight; *cotyledons* flat.—*Shrubs* or small *trees*. *Leaves* pinnate, with an odd one; *leaflets* serrate. *Stipules* adnate to the petiole (D. C.)

Sp. Char.—*Prickles* uniform, hooked. *Leaves* naked or slightly hairy; their disk eglandulose. *Calyx-segments* fully pinnate, deciduous. *Styles* not united. *Shoots* assurgent (Hooker).

The British Roses answering to these characters are subdivided by Hooker (*British Flora*) as follows:—

α. *R. canina* Woods, Smith. *Leaflets* carinate; serratures simple.
β. *R. sarmentacea* Woods, Smith. *R. canina*, Curtis. *Leaflets* naked, carinate; serratures compound.
γ. *R. surculosa* Woods. *R. canina β*, Smith. *Leaflets* naked, flat; serratures simple.
δ. *R. dumetorum* Woods, Smith. *Leaflets* more or less hairy, flat.
ε. *R. Forsteri*, Smith. *R. collina* Woods. *Leaflets* more or less hairy, not flat.

Decandolle (*Prodr.* ii. 613) admits no less than nineteen varieties of *R. canina*, Linn.

Ramification variable in denseness. *Shoots* more or less arched or erect, according to the vigour of the plant. *Prickles* not very numerous, hooked in various degrees, and compressed; their base considerably dilated. *Leaflets* variable in width; their serratures, although scarcely compound, except in β., are mostly irregular in size. *Bracts* variable in size. *Peduncle* and *calyx-tube* commonly naked; their setæ, when present, feeble and not numerous; *calyx-segments* free from glands, or more or less copiously fringed with them. *Styles* hairy. *Fruit* coral-red, or more scarlet [usually oblong, elliptical or ovate, rarely somewhat globose], soft and pulpy when ripe, with a pleasant somewhat acid taste (Hooker).

Hab.—Indigenous. Thickets, hedges, &c.; very common. Flowers in June and July. Perennial.

Description.—The fruit used in medicine under the name of the *hip*, or *hep (fructus rosæ caninæ* seu *f. cynosbati)*, is oval, composed externally of the persistent calyx, whose sides have become thick, fleshy, beautifully red, and shining; and internally, of numerous, hard, hairy akenia (commonly called seeds, but which, in fact, are the carpels, or real fruits), containing each an exalbuminous seed. The pulp or fleshy matter of the persistent calyx is sweet, acidulous, and pleasant to the taste, especially when mellowed by the frost. The hairs surrounding the akenia act as mechanical irritants, like the hairs of the pods of the cowhage, and when swallowed are apt to occasion gastric uneasiness, vomiting, and pruritus about the anus; whence one of the French vulgar names for the fruit, *gratte-culs.*

Composition.—According to Bilz (Gmelin, *Handb. d. Chem.* ii. 1270), 100 parts of the dried ripe fruit, deprived of akenia and hairs, consist of the following substances:—*volatile oil* a trace, *fatty oil* 0·065, *myricin* of the scale 0·05, *soft resin* of the pulp 1·419, *reddish-yellow hard resin* 0·463, *tannin* 0·260, *incrystallizable sugar* 30·6, *gum* 25·0, *epidermis* 4·552, *medullary fibre* 14·0, *citric acid* 2·95, *malic acid* 7·776, *citrates, malates, mineral salts, water* (and *loss*) 12·865.

Physiological Effects and Uses.—The pulp is nutritive and slightly refrigerant and astringent. It is only employed in medicine in the preparation of a *conserve.*

Confectio Rosæ Caninæ, L. *Conserva Rosæ Fructûs*, E. *Conserva Cynosbati. Conserve of Hips.* (Dog-Rose [Pulp of the fruit], lb.j. Sugar, powdered, ℥xx. Expose the pulp of the Rose to a gentle heat in an earthen vessel; then gradually add the Sugar, and rub together until they are thoroughly incorporated, *L.*—Take any convenient quantity of Hips, carefully deprived of their carpels; beat them to a fine pulp, adding, gradually, thrice their weight of white sugar, *E.*) In the preparation of this conserve the akenia or carpels (commonly termed seeds) with their hairs, must be carefully separated, on account of the irritation they are apt to occasion (see above).—It is probable that the fruit of several varieties (or species?) are employed indiscriminately in the preparation of this conserve. The observation of Sir J. E. Smith deserves notice, that the flavour of the fruits, casually gathered late in autumn present a great diversity of flavour (*Eng. Fl.* ii. 395). This conserve being saccharine and acidulous, is nutritive and refrigerant. It is usually employed as a convenient and agreeable vehicle for other remedies; as for a pill-basis, or for the making of electuaries or linctuses. A very agreeable pectoral linctus containing almond oil, and, sometimes, syrup of poppies, is made with this conserve, acidulated with dilute sulphuric acid. A drawback to the use of this conserve is its tendency to candy or concrete by keeping.

Ro'sa gal'lica, Linn. L. E. D.—*French* or *Red Rose.*

Sex. Syst. Icosandria, Polygynia.
(Petala, *L. D.*—Petals, *E.*)

History.—Perhaps our red rose may be the *Rosa Milesia* of Pliny (*Hist. Nat.* lib. xxi. cap. 10, ed. Valp.), the colour of which, he says, was very warm [*ardentissimus*], and whose petals did not exceed twelve in number. The *Rosa Trachinia*, he adds, stands next to this, but is less red.

Botany. *Gen. Char.*—See *Rosa canina.*

Sp. Char.—*Prickles* unequal. *Stipules* narrow, straggling at the point. *Leaflets* five to seven, coriaceous, rigid, ovate or lanceolate, deflexed. *Flower-bud* ovate-globose. *Sepals* spreading during flowering. *Fruit* somewhat globose, very coriaceous. *Calyxes* and *peduncles* more or less very finely glandulose-hispid, somewhat viscous (D. C.)

A small *shrub*. Very variable in *form.*—Decandolle (*Prodr.* ii. 603) admits twelve distinct varieties. Mr. G. Don (*Syst. of Gard.*) enumerates more than two hundred sorts cultivated by gardeners. And we are told (*Journ. de Pharm.* xii. 443) that the Dutch cultivators have more than five hundred varieties. The variety cultivated at Mitcham, where it is called the *Damask Rose*, appears to me to be *R. gallica*, var. δ. *officinalis*, Decandolle.

Hab.—South of Europe. Common in gardens. For medicinal purposes cultivated at Mitcham.

Description.—The dried petals of the unexpanded flowers, deprived of their white claws or heels (*ungues*), constitute the *red-rose leaves* (*flores rosæ rubræ*) of the shops. The flower-buds are brought to market when about the size of a large nutmeg. The calyx and claws being cut off, the petals are speedily dried. At Mitcham this is effected in a stove. Slow desiccation impairs both their astringency and colour. The petals of the buds are much more astringent than of the full-blown flowers: hence they are preferred for medicinal use. When dried they are sifted to remove the stamens, insect-eggs, &c. 2000 flowers yield about 100 lbs. of fresh petals or 10 lbs. of dried ones. The dried petals have a velvety appearance: their colour is purplish-red; their odour, which is principally developed during desiccation, is agreeable; their taste is bitterish and astringent. As they lose their fine colour when exposed to light and air, and are apt to become mouldy or worm-eaten, they should be carefully preserved in bottles or canisters.

Composition.—The petals were analyzed by Cartier (*Journ. de Pharm.* vii.), who found the following substances:—*volatile oil, colouring matter, tannin, gallic acid, fatty matter, albumen, potash soluble salts, calcareous insoluble salts, silica, and oxide of iron.*

1. *Astringent Matter* (*tannic and gallic acid*).—The presence of astringent matter is shewn by the very dark colour (*tannate and gallate of iron*) produced in an infusion of red roses by the ferruginous salts, and by the slight precipitate (*tannate of gelatine*) caused on the addition of a solution of gelatine.

2. *Colouring Matter.*—Has not yet been isolated. A watery infusion of red-rose leaves has a pale yellowish red colour: the alcoholic tincture is also pale coloured. On the addition of sulphuric acid an intense bright red colour is produced (*sulphate of the colouring matter?*). Alkalies communicate a greenish tint to the watery infusion (probably by neutralising the free acid to which, with the colouring matter, the red tint is owing). Sulphurous acid destroys the colour of the infusion of roses (*sulphite of colouring matter?*); but on the addition of sulphuric acid the intense bright red (*sulphate of ditto*) is produced with an evolution of sulphurous acid gas. Dr. Clarke and others

had supposed that the red colour was owing to iron; but both Gay-Lussac and Cartier found more iron in white than in red roses. Thus 1000 grains of the white rose yielded the latter chemist 99 grains of ashes containing 12·4 of iron; while the like quantity of the red rose yielded 50 grains of ashes, in which were only 4 grains of oxide of iron.

Physiological Effects and Uses.—Red-rose leaves are mild astringents and tonics; but their power is exceedingly slight, and scarcely deserves notice. By the Arabian physicians Avicenna and Mesue, as well as by more recent writers, Riverius, Krüger, and others, conserve of roses was esteemed a valuable remedy in phthisis (Murray, *App. Med.* iii. 168). At the present time red-rose leaves are principally used for their colour and flavour. They yield several officinal preparations, which are valuable as forming elegant vehicles for the exhibition of other more active medicines. The full-blown flowers are said to be as laxative as those of *R. centifolia.* "Poterius relates that he found a drachm of powdered red roses occasion three or four stools, and this not in a few instances, but constantly, in an extensive practice for several years" (Lewis, *Mat. Med.*)

1. *Infusum Rosæ compositum*, L. *Infusum Rosæ*, E. *Infusum Rosæ acidum*, D. *Infusion of Roses.*—(Petals of Rosa gallica [deprived of their claws, *D.*], dried, ʒiij. [℥ss. *D.*]; Diluted Sulphuric Acid, fʒiss. [fʒiij. *D.*]; Sugar [pure, *E.* refined, *D.*], ʒvj. [℥iss. *D.*]; Boiling Water [distilled, *L.*], Oj. [Oiij. *D.*] Pour the Water upon the Rose petals in a glass vessel; then mix in the Acid. Macerate for six hours [half an hour, *D.*], and strain the liquor [when cool, *D.*]; lastly add the sugar to it, *L. D.*—The *Edinburgh College* infuses the petals in the water for four hours, in a vessel of glass or porcelain, not glazed with lead; then adds the acid, strains through linen or calico, and dissolves the sugar in the strained liquor.) The lengthened maceration of six or even four hours is unnecessary. An hour, or perhaps even half an hour, is quite sufficient. Infusion of roses is a mild but very agreeable refrigerant and astringent, and is a very pleasant drink in febrile disorders, hemorrhages, diarrhœa, and colliquative sweats. It forms a very elegant vehicle for other medicines, as for saline purgatives (especially sulphate of magnesia, the unpleasant taste of which it serves greatly to cover), for disulphate of quinia (which is dissolved in the water by the free sulphuric acid, which also serves to prevent the tannic acid of the roses precipitating the quinia), the mineral acids, bitter tinctures and infusions, alum, &c. It serves as a very useful gargle; for which purpose acids, nitre, alum, or tincture of capsicum, are usually conjoined. Of course the alkalies and the earths, as well as their carbonates, are incompatible with it; they neutralize the acid, and change the colour of the preparation to green. Sulphate of iron communicates a deep olive colour, and after some hours causes a precipitate. The sulphuric acid of the infusion of roses decomposes and destroys the activity of acetate of lead, by forming sulphate of lead. It is a common practice, however, though of course among ignorant practitioners only, to administer, in hemorrhages, a pill composed of acetate of lead and opium, and at the same time infusion of roses! (see p. 518). The dose of infusion of roses is f℥j. to f℥ij. Each f℥j. contains 4½♏ of dilute sulphuric acid, which are nearly equivalent to three-sevenths of a minim of strong sulphuric acid.

2. *Confectio Rosæ gallicæ*, L. *Conserva Rosæ*, E. D. *Conserve of Red Roses.*—(Petals of the Rosa gallica [petals of the buds, rejecting

the claws, *D.*], lb. j.; Sugar [refined, *D.*] lb. iij. Beat the rose petals in a stone mortar, then, the sugar being added, beat them again until they are thoroughly incorporated, *L. D.*—Beat the petals of the Rosa gallica to a pulp, gradually adding thrice their weight of white sugar, *E.*) This preparation is slightly astringent. It was formerly much esteemed in phthisis (see p. 1122). Its principal use now is as a vehicle for the exhibition of other medicines. Thus it is a common pill-basis for calomel, disulphate of quinia, &c. *Pilulæ hydrargyri* (see p. 455) are prepared with it. Alone or conjoined with the confection of dog rose (see p. 1120) it forms the bases of some elegant pectoral linctuses or electuaries, containing almond oil, diluted sulphuric acid, syrup of poppies, &c. Over the confection of dog rose it has the advantage of having no tendency to candy. Furthermore it does not ferment or become mouldy. Dose ʒj. to ʒij. or more.

3. *Mel Rosæ*, L. E. D. *Honey of Roses.*—(Petals of Rosa gallica [Petals of the buds, deprived of their claws, *D.*], dried, ℥iv.; Boiling Water, Oijss. [Oiij. wine measure, *D.*]; Honey, lb. v. Macerate the Rose petals in the Water for six hours; then add the Honey to the strained [and decanted, *E.*] liquor, and boil down to a proper consistence, in a water bath [removing the scum, *E.D.*]) A mildly astringent and very agreeable preparation, principally employed in the diseases of children. It is used sometimes alone as a mild detergent in slight aphthous affections, or inflammatory conditions of the mouth and throat; or as an agreeable vehicle for the exhibition of other more powerful remedies. It is occasionally added to detergent or astringent gargles. Dose, for children, ʒj.

4. *Syrupus Rosæ gallicæ*, E.—(Dried Red-rose petals, ℥ij.; Boiling Water, Oj.; Pure Sugar, ℥xx. Proceed as for the syrup of damask rose). This syrup, though very slightly astringent, is principally valuable for its red colour, on account of which it is sometimes added to mixtures and electuaries (as the *Electuarium Catechu*, E.)

Ro'sa centifo'lia, Linn. L. E. D.—*The Hundred-leaved* or *Cabbage Rose.*

Sex. Syst. Icosandria, Polygynia.

(Petala, *L. D.*—Petals. Volatile Oil of the Petals, *E.*)

History.—Theophrastus (*Hist. Plant.* vi. 6) speaks of a *Rosa centifolia* (Ῥοδον ἑκατονάφυλλα) which grew abundantly about Philippi. Herodotus (*Urania*, cxxxviii.) mentions a rose growing naturally in Macedonia, and which had sixty leaves, and more than ordinary fragrance. This perhaps was *R. centifolia.* Pliny (*Hist. Nat.* lib. xxi. cap. 10, ed. Valp.) also notices the *R. centifolia.*

Botany. *Gen. Char.*—See *Rosa canina.*

Sp. Char.—*Prickles* nearly straight, scarcely dilated at the base. *Leaflets* five to seven, ovate, glandular and flaccid at the margin, hairy beneath. *Flower-bud* ovate, short. *Sepals* during flowering, spreading, not deflexed. *Fruit* ovate, somewhat pulpy. *Calyxes* and *peduncles* glandulose-hispid, rigid, fragrant (D. C.)

Decandolle admits seventeen distinct varieties. In gardens are found above eighty sorts. One of the best known of them is the *Moss Rose* (*R. muscosa*). At Mitcham the sort cultivated for medicinal purposes, under the name of the *Provins* or *Cabbage Rose*, appears to me to agree with the var. *α. vulgaris *foliacea* of Decandolle. Its *leaflets* are oval or rounded-oval. The larger *prickles* slightly falcate.

Hab.—Asia. Cultivated at Mitcham and other places for medicinal purposes.

Description.—The petals of the hundred-leaved rose (*flores rosæ centifoliæ* seu *pallidæ*) are commonly termed in the shops *Provins* or *Cabbage-rose leaves.* They should be gathered when the flowers are full blown, and before the petals begin to fall. Their odour is strongest when they are of a fine pale red, and before they begin to fade. When freed from the calyx cups and stamens they are to be dried in the air. Unlike the petals of *R. gallica*, desiccation diminishes their fragrance. Their odour is said to be singularly exalted by iodine (Chereau, *Journ. de Pharm.* xii. 442.) Their taste is sweetish, though somewhat acidulous and bitter. To preserve them, rose leaves are frequently *pickled* or salted (*flores rosæ saliti*) like elder flowers (see p. 1033).

Composition.—I am unacquainted with any analysis of the petals of the *Rosa centifolia.* The following, however, may be regarded as the ascertained constituents:—*volatile oil*, *gallic* (and tannic ?) *acid*, *colouring matter*, *a saccharine matter* (sweet extractive of Pfaff), *woody fibre*, *mineral salts*, and *oxide of iron.*

1. *Volatile Oil of Roses* (*Oleum Rosæ*, E. *Attar* or *Otto of Roses*).—Obtained in the East by distilling roses with water. The attar concretes and floats on the distilled water when cold (Polier, *Asiat. Research.* i. 332; Jackson, *Ed. New Phil. Journ.* xxviii. 326). In Northern India, rose water and attar are distilled from *R. damascena* (Royle, *Illustr.* 203). The precise species of rose used at Ghazeepoor, in Hindostan, where the attar is extensively distilled, as well as at Shiraz, in Persia, has not been satisfactorily ascertained. At the latter place a rose with white flowers is said to be used (Fée, *Hist. Nat. Pharm.* ii. 127). Is it *R. moschata?* In the manufacture of rose water in England, from *R. centifolia*, a crystalline volatile oil with the odour of the attar is frequently obtained (*English attar of roses*). Polier says, that to procure something less than three drachms of attar from 100 lbs. of rose leaves, in India, the season must be very favourable, and the operation carefully performed. Jackson states, that from one lac of roses it is generally calculated that 180 grains, or one tolah of attar, can be procured. Heber (*Narrative*, i. 266) says, 20,000 roses yield attar equal in weight to that of a rupee. According to Donald Monro (*Treat. on Med. and Pharm. Chym.* ii. 311) the attar is procured without distillation, merely by macerating the petals in water. But Trommsdorf (Martius, *Pharmakogn.*) tried the method, and failed to procure any oil.

Attar of roses is imported from Constantinople and Smyrna. The duty on it is 1s. 4d. per lb. In 1838, 973 lbs.; in 1839, 745 lbs. paid duty (*Trade List.*)

At temperatures below 80° F. attar of roses is a crystalline solid. It is usually almost colourless, but Polier says, colour is no criterion of its goodness, quality, or country. Undiluted, its odour is somewhat too powerful to be agreeable, but, when properly diffused through the air or some liquid, is most delicious. It is combustible, and with oxygen forms an explosive mixture. It fuses at between 84° F. and 86° F. Its sp. gr. at 90° F. is 0·832; water at 60° F. being 1·0. (Saussure, *Ann. Chim. et Phys.* xiii. 337.) At 57° F. 1000 parts of alcohol (sp. gr. 0·806) dissolve 7 parts, and at 72° F. 33 parts of attar.

Attar of roses has been analyzed by Saussure and Blanchett, but their results do not accord.

Blanchett's Analysis.

	Atoms.	*Eq. wt.*	*Per cent.*
Carbon	23	138	74·59
Hydrogen	23	23	12·43
Oxygen	3	24	12·98
Attar of Roses	1	185	100 00

Saussure's Analysis.

	Per cent.
Carbon	82·053
Hydrogen	13·124
Oxygen	3·949
Nitrogen	0·874
	100·000

Sandal-wood oil, oil of rhodium, some of the fixed oils, and spermaceti, have been said to be occasionally employed for adulterating attar of roses. But as far as my observation extends the attar found in the shops of London is very pure.

Attar of roses consists of two volatile oils: one solid, the other liquid, at ordinary temperatures, in the proportion of about one part of the first to two parts of the second. To separate them the attar is to be frozen and compressed between folds of blotting paper, which absorbs the liquid and leaves the solid oil; or they may be separated by alcohol (of sp. gr. 0·8), which dissolves the liquid, but takes up scarcely any thing of the solid oil.

α. *Solid Oil of Roses* (*Rose-Camphor; Stéaroptène of Oil of Roses*).—Occurs in crystalline plates, fusible at about 95° F. It is composed, according to Saussure, of *carbon* 86·743, and *hydrogen* 14·889; or an equal number of atoms of carbon and hydrogen. Blanchet states its composition to be, *carbon* 85·86, *hydrogen* 14·46.

β. *Liquid Oil of Roses* (*Eléoptène of Oil of Roses*).—Has not been accurately examined. But from Saussure's analysis of the ordinary attar and of its stéaroptène, it would appear to contain oxygen and nitrogen, in addition to carbon and hydrogen. By calculation the proportions appear to be, *carbon* 80·56, *hydrogen* 12·42, *oxygen* 3·92, *nitrogen* 1·3 (Dumas, *Traité de Chim.* i. 494).

2. *Laxative principle.* (*Sweet extractive* of Pfaff.)—The nature of the laxative principle of the hundred-leaved rose has scarcely been examined. Pfaff (*Mat. Med.* Bd. iv. S. 277) declares it to be sweet extractive.

PHYSIOLOGICAL EFFECTS AND USES.—The petals are mildly laxative, and are employed, on this account, in the form of syrup (see *Syrupus Rosæ*).

On account of its delightful fragrancy this rose is in common use for nosegays and scent-bags, and is employed for the distillation of *rose water*. Its odorous emanations, however, are not always innocuous; but on some persons have acted as a poison (see Murray, *App. Med.* iii. 160; Orfila, *Toxicol. Gén.*), causing symptoms which, for the most part, are those indicating a disordered condition of the cerebro-spinal system—such as headache, fainting, and hysterical symptoms; and occasionally giving rise to local irritation, manifested by sneezing and inflammation of the eyes.

1. *SYRUPUS ROSÆ*, L. D. *Syrupus Rosæ centifoliæ*, E. *Syrup of Roses.* (Petals of Rosa centifolia [Damask Rose, *E.*] dried, ℥vij. [lb. j. *E.*]; Sugar [pure, *E.*], lb. vj. [lb. iij., *E.*]; Boiling Water, Oiij. [Oiv. wine measure, *D.*] Macerate the Rose Petals in the Water for twelve hours, and strain. [Evaporate the strained liquor, in a water-bath, to Oij. *L. D.*] Then add the sugar [dissolve with the aid of heat, *E.*] and strain).—Gently laxative. Used only for young children. Dose, fʒij. to f℥j. Its red colour is heightened by acids; alkalies change it to green or yellow.

2. *AQUA ROSÆ*, L. E. D. *Rose Water.* (Petals of Rosa centifolia, lb. x.; Proof Spirit, f℥vij. [Rectified Spirit, f℥iij. *E.*]; Water, *Cong.* ij. Let a gallon distil.—"The petals should be preferred when fresh; but it also answers well to use those which have been preserved, by beating them with twice their weight of muriate of soda," *E.*—The *Dublin College* directs lb. viij. of the petals of Rosa centifolia, and a sufficient quantity of water, to prevent empyreuma. Distil a gallon).—Rose water is prepared both from fresh and pickled rose leaves, but of course the former are preferable. To prevent its becoming sour it should be preserved in well-corked bottles, kept in cool places. Spirit of wine ought not to be mixed with it, for if a sufficient quantity be added to preserve the water, it renders it unfit for some medicinal purposes. Rose water is employed, on account of its odour only, as an addition to lotions, collyria, &c.

3. *OLEUM ROSÆ*, E. *Attar* or *Otto of Roses.* (Its preparation and

chemical properties have been already described, see p. 1124).—It is employed for scenting only. In the shops various perfumes are sold, which owe their odour to the attar. Thus *oil for the hair*, sold as *huile antique rouge à la rose*, is merely olive oil coloured by alkanet (see p. 881), and scented with the attar. *Milk of roses* also contains the attar. Several compound scents owe a portion of their fragrance to this oil, as *lavender water* (see p. 826). The Edinburgh College has, very properly as I conceive, introduced this oil into the pharmacopœia; for, as scents are frequently required to be communicated to medicines, I cannot conceive why the most delicious perfume should be excluded from the Materia Medica. It may be employed as an addition to unguents, spirit washes, &c.

TRIBE IV.—*POMACEÆ.*

Cydo'nia vulga'ris, Persoon, L.—*Common Quince.*

Py'rus Cydo'nia, *Linn.*

Sex. Syst. Icosandria, Pentagynia.

(Semina, *D.*)

HISTORY.—Hippocrates (*Opera*, 497, ed. Fœs.) employed the quince-apple (κυδώνια) as an astringent in diarrhœa. The Romans called this fruit *malum cotoneum* (Pliny, *Hist. Nat.* lib. xv. cap. 11, ed. Valp.)

BOTANY. *GEN. CHAR.*—*Calyx* five-cleft. *Petals* somewhat orbicular. *Stamens* erect. *Styles* five. *Pome* closed, five-celled; cells many-seeded, cartilaginous. *Seeds* enveloped with mucilaginous pulp.—Small *trees*. *Leaves* undivided, quite entire, or serrate. *Flowers* large, solitary or few, somewhat umbellate (D. C.)

SP. CHAR.—*Leaves* ovate, obtuse at the base, quite entire; their lower surface, as well as the *calyx*, tomentose (D. C.)—A small, much-branched, usually crooked *tree*. *Petals* pale rose-colour or white. *Pome* varying in shape, yellow, covered with a thin cottony down, very austere, but having a peculiar fragrance.

Decandolle admits three varieties:—

α. *Maliformis.* *Apple Quince.*—*Pome* almost globose. Cultivated.

β. *Lusitanica.* *Portugal Quince.*—*Leaves* broader. *Pome* larger. Cultivated.

γ. *Oblonga.* *Oblong* or *Pear Quince.*—*Leaves* oval or oblong. Cultivated and wild.

HAB.—South of Europe. Cultivated in gardens. Flowers in May and June.

DESCRIPTION.—Quince seeds (*semina cydoniæ*) are ovate-acute, flat on one side, convex on the other, and of a reddish-brown colour. The most external coat (*epidermis seminalis*, Bischoff) is composed of very fine cells, in which is lodged a large quantity of mucilage. When, therefore, these seeds are thrown into water, the mucilage swells up, distends, and ultimately bursts the tender cells (see Bischoff, *Handb. d. bot. Termin.* tab. xlii. fig. 1859).

COMPOSITION.—No analysis of either fruit or seeds has been made. The FLESHY PULP of the fruit contains an *astringent matter*, *malic acid*, *sugar*, *pectine* or *vegetable jelly*, a *nitrogenous matter*, probably *volatile oil*, *water*, and *vegetable fibre*. The SEEDS contain *colouring matter*, *tannic acid*, a large quantity of a *peculiar gummy matter* in their outer coat, probably *amygdalin* (as Stockmann obtained hydrocyanic acid from the seeds by distillation), *emulsin*, *starch*, *fixed oil*, and *woody fibre*.

Cydonin (Peculiar gum of Quince seed; Bassorin; Mucus; Quince Mucilage).—One part of quince seed forms, with forty parts of water, a thick mucilage, which produces, with the following salts, gelatinous coagula or precipitates; acetate and diacetate of lead, protochloride of tin, nitrate of mercury, and sesquichloride of iron. Rectified spirit produces at first scarcely any effect; after some time partial coagulation is effected. Oil of vitriol communicates a pinkish tint, and causes the separation of a frothy coagulum, which floats on the mixture. Silicate of potash, infusion of nutgalls, and oxalate of ammonia, produce no change in the mucilage. Quince mucilage, usually termed bassorin, appears to me to be a peculiar substance: hence I propose to call it *cydonin*. It is distinguished from *arabine* (see *gum Arabic*) by the effect of alcohol, silicate of potash, sulphuric acid, and oxalate of ammonia; from *bassorin* and *cerasin* (see below) by its solubility in water, both hot and cold; from *tragacanthin* (see *gum tragacanth*) by the effect of sulphate of iron, oxalate of ammonia, and alcohol; from *carrageenin* (see p. 564) by the effect of silicate of potash and acetate of lead.—(For some experiments on mucilage of quince seed, see Bostock, in *Nicholson's Journal*, vol. xviii. p. 31).

PHYSIOLOGICAL EFFECTS.—The *fruit* is not eatable in its raw state. Stewed in pies or tarts, along with apples, it is much esteemed. The expressed juice (*succus cydoniæ*) is said to be cooling and astringent. An excellent *marmalade* (*miva cydoniæ*) and *syrup* are prepared from the quince by the confectioner. The *mucilage of quince seed* is nutritive, demulcent, and emollient. The whole seeds, if taken in large quantity, would, perhaps, act like bitter almonds (see p. 1110), as they are said to yield hydrocyanic acid.

USES.—Quince seeds are employed in medicine only on account of the mucilage which they yield.

DECOCTUM CYDONIÆ, L. *Mucilage of Quince Seed.* (Quince seed, ʒij.; Distilled Water, Oj. Boil with a gentle heat for ten minutes, and strain).—Never used internally. Employed externally as an emollient and sheathing application to cracked lips and nipples; to the inflamed conjunctiva; to the skin when affected with erysipelas; to painful hemorrhoidal tumours, &c. Hair-dressers use it, as a cement, for dressing the hair in braids.

Other Medicinal Rosaceæ.

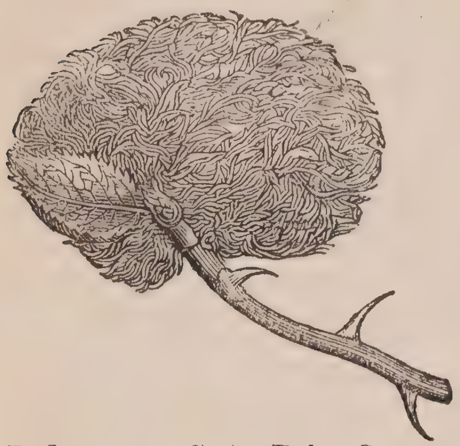
From the stems of the *Cherry* (*Cerasus avium*), *Plum* (*Prunus domestica*), and some other rosaceous trees, there exudes a mucilaginous liquor, which concretes into tears, forming the *gummi nostras*, *cherry-tree gum* (*gummi cerasi*), *plum-tree gum* (*gummi pruni*), &c. It may be employed in medicine as a substitute for tragacanth gum. It consists of two gummy principles: one called *arabine* (see *gum Arabic*), soluble in cold water; the other termed *prunin* or *cerasin*, insoluble in cold, but soluble in hot water.

Alchemilla arvensis, *Field Ladies' Mantle*, or *Parsley Piert*, is a small, indigenous, herbaceous plant, with green flowers. It belongs to *Tetrandria, Monogynia*, in the sexual system. It is astringent (owing to tannic acid), and, perhaps, slightly mucilaginous. It was formerly eaten raw or pickled, and thought serviceable in cases of gravel or stone: hence it was called *break-stone*. Prout (*Inq. into the Nat. and Treat. of Diabetes*, &c. pp. 149 and 185, 2nd ed.) regards it as a diuretic, and as producing, in particular states of the system, a large secretion of lithic acid. A strong infusion of it, taken frequently, sometimes gives great relief, he says, in the less severe cases of the phosphatic or earthy deposit, where the source of irritation is chiefly confined to the urinary organs, and where the constitution is sound, and the strength not remarkably reduced.

On various species of *Rosa*, perhaps most frequently on *R. rubiginosa*, the *Sweet*

Briar or *Eglantine*, is found a remarkable gall, called the *Sweet Briar Sponge* (*Bedeguar* seu *Fungus Rosarum*). Pliny terms it, in one place (*Hist. Nat.* lib. xxi. cap. 73, ed. Valp.), *a little ball* (*pilula*), in another (*Ibid.* lib. xxv. cap. 6) *a sponge* (*spongiola*). It is produced by the puncture of several insect species; viz. *Cynips Rosæ* and *Brandtii* (both of which are elaborately described by Ratzeburg, *Mediz. Zoolog.* Bd. ii. S. 146, et seq.), and a species of *Mesoleptus*. Other species (as those of *Diplolepis* and *Pteromalus*) are also found in these galls; but they are probably parasites, and not the true inhabitants. The Bedeguar is usually rounded, but of variable size, sometimes being an inch, or an inch and a half, or more, in diameter. Externally it looks shaggy, or like a ball of moss, being covered with moss-like branching fibres, which are at first green, but become afterwards purple. The nucleus is composed principally of cellular tissue, with woody fibre; and where the fibres are attached, bundles of spiral vessels are observed. Internally there are numerous cells, in each of which is the larva of an insect: if opened about August or September, maggots (larvæ) are usually found. It is inodorous, or nearly so; its taste is slightly astringent, and it colours the saliva brownish. It has not been analyzed, but is suspected to contain tannic and gallic acids. Dried and powdered, it was formerly given in doses of from ten to forty grains, as a diuretic and lithontriptic. More recently it has been recommended as an anthelmintic, and as a remedy against toothache. Pliny says, the ashes mixed with honey were used as a liniment for baldness. In another place he speaks of the fungus being mixed with bear's grease, for the same purpose.

Fig. 206.



Bedeguar, or Sweet Briar Sponge.

Order 58. Legumino'sæ, *Jussieu.*—The Bean Tribe.

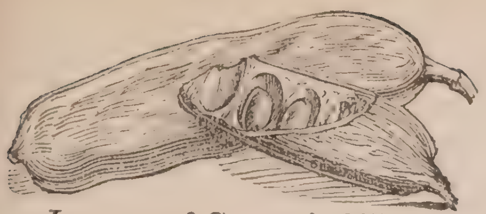
Fabaceæ, *Lindley.*

Essential Character.—*Calyx* of five (rarely of four) sepals, more or less united at the base, and, therefore, five-toothed, five-cleft, or five-partite; sepals unequal, in some cases almost equally coherent, in others concreted into two lips; the upper consisting of two sepals, which are either free at the apex or united; the lower of three sepals generally distinct at the apex. *Petals* five, or, by abortion, four, three, two, one, or none; generally unequal, inserted usually into the base of the calyx, rarely on the torus; in general variously imbricated, rarely valved, almost always free, sometimes united into a gamopetalous corolla. [In the sub-order *Papilionaceæ*, the petals form a *butterfly-shaped* or *papilionaceous* corolla, composed of a large upper petal called *vexillum* or *standard*, two lateral ones termed *alæ* or *wings*, and an inferior keel-shaped one denominated *carina* or *keel*, and which is, in fact, composed of two petals adherent at their margin.] *Stamens* inserted with the petals, generally double the number of the latter, rarely triple or quadruple or fewer; altogether free or the filaments variously connected, being monadelphous, with the tube entire or cleft above, or diadelphous nine and one, or five and five, very rarely triadelphous: *anthers* two-celled. *Carpel* generally one, the others being abortive; or two to five. *Ovary* oblong or ovate, sessile or stipitate, free, or, very rarely, adnate by the stipe to the calyx. *Style* one, filiform, arising from the upper suture: *stigma* terminal or lateral. *Legumes* two-valved, membranous; cori-

Fig. 207.

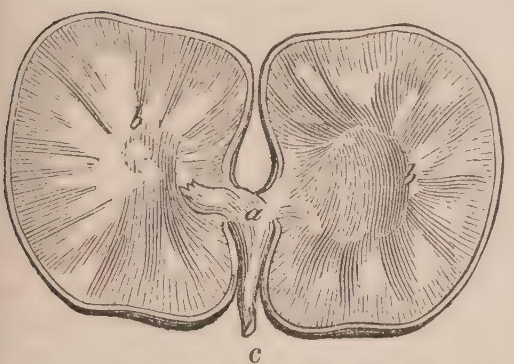
Papilionaceous flowers.

Fig. 208.



Legumes of Ceratonia Siliqua.

Fig. 209.



Common Garden Bean.

a. Plumule.
b. Cotyledons or seed lobes.
c. Radicle bent on the cotyledons (*curvembriæ*).

aceous, rarely fleshy or drupaceous, dehiscent or indehiscent, one-celled; or by the folding in of one of the sutures, longitudinally two-celled; or by isthmi or articulations, transversely many-celled. *Seeds* two, or many, or by abortion (?) solitary, affixed to the upper suture, inserted alternately into each valve, frequently oval or reniform; *funiculus* various, rarely expanded into an arillus; *testa* smooth, frequently very much so, and stony; *endopleura* often tumid, simulating albumen. *Embryo* sometimes straight [*rectembriæ*], or curved [*curvembriæ*], the radicle being inflexed on the commissure of the lobes (*homotropal* or *pleurorhizous*); in either case the radicle directed towards the hilum: *cotyledons* foliaceous or fleshy; the first exsert, the latter germinating within the spermoderm, under ground.—*Trees*, *shrubs*, or *herbs*, with alternate, bistipulate, simple, or variously-compounded *leaves*.—(Condensed from Decandolle, with additions within the square brackets).

Properties.—Exceedingly variable. Similar organs of different, though often closely-allied, species are frequently found to elaborate most dissimilar principles; and, of course, the dietetical, medicinal, or poisonous properties vary in a corresponding manner. (For details, consult Dierbach, *Abhandl. ü. d. Arzneikraft. d. Planzen;* and Decandolle, *Essai sur les Propr. Méd.*)

Sub-order 1.—*Papilionaceæ.*

Myrosper'mum peruif'erum, Decandolle, E.—*The Quinquino.*

Myrox'ylon peruife'rum, *Linn. L. D.*

Sex. Syst. Decandria, Monogynia.

(Balsamum liquidum, *L.*—Fluid balsamic exudation, *E.*—Balsamum, *D.*)

History.—This balsam was first mentioned by Nicholas Monardes under the name of *balsamum* (Clusius, *Exot.* 303). No accurate notions of the tree yielding it were entertained until 1781, when Mutis sent some branches of it to the younger Linnæus (Murray, *App. Med.* vi. 111). Ruiz (Lambert, *Illustr. of the Genus Cinchona*, p. 92) afterwards described it.

Botany. *Gen. Char.*—*Calyx* campanulate, five-toothed, persistent. *Petals* five, the upper one largest. *Stamens* ten, free. *Ovary* stipitate, oblong, membranous, with two to six ovules; *style* towards the apex filiform, lateral. *Legume*, with stalk naked at the base but winged superiorly, samaroïdal [*legumen samaroïdeum* D. C.], indehiscent, one-celled, one or two-seeded, laterally pointletted by the style. *Seed* besmeared with balsamic juice: *cotyledons* thick, plane (D. C.)

Sp. Char.—*Leaves* coriaceous, persistent, smooth as well as the *branches*. Wing of the *legume* very thick, not veined. *Style* deciduous (D. C.)

A branching, elegant *tree*. *Bark* thick, very resinous. *Leaves* pinnated, alternate; leaflets two to five pairs, alternate ovate-lanceolate. *Racemes* axillary. *Petals* white. *Legume* somewhat coriaceous, straw-coloured, about four inches long including the stalk. *Seeds* reniform.

Hab.—Peru, New Grenada, Columbia, and Mexico. Grows in low, warm, and sunny situations.—Flowers from August to October.

Collection.—Monardes (*op. cit.* p. 302) says, that there are two modes of procuring the balsam; viz. incision into the bark of the tree, and coction of the branches and trunk in water. The first method yields a *white liquid balsam*, the second *a blackish red liquid.* Ruiz (*op. cit.* p. 95) states, that the white liquid balsam is preserved for years in bottles, in the fluid state; but when deposited in mats or calibashes, which is commonly done in Carthagena, and in the mountains of Tolu, it, after some time, condenses and hardens into resin, and is then denominated *dry white balsam* or *balsam of Tolu;* while the extract made by boiling the bark in water is blackish, remains liquid, and is known by the name of *black Peruvian balsam.* There is, however, obviously some confusion in this statement; and several reasons have led pharmacologists to doubt whether the black balsam of the shops is obtained by coction. Ruiz does not speak from his own observation, but on the authority of Valmont de Bomare. Lastly, Hernandez (*Rev. Med. Nov. Hisp. Thes.* p. 51, 1651) says, the balsam obtained by incision is yellowish-black (*e fulvo in nigrum*). Professor Guibourt has received from M. Bazire balsam of Peru, which he obtained in great abundance on the coast of Son Sonaté, in the state of San-Salvador (the republic of Guatimala) by incisions into the stem of a Myrospermum, whose fruit is very different to that of M. peruiferum (*Hist. des Drog.* ii. 590, 3me éd.) Th. Martius (*Pharmakogn.*) suggests, that the black balsam of Peru is procured by a kind of *destillatio per descensum*; but the absence of pyrogenous products in the balsam seems to me to be averse to this opinion.

Commerce.—Balsam of Peru is imported in pear-shaped earthen-ware pots, and in tin canisters, from Valparaiso, Islay, Lima, Truxillo, Callao, Iquique, Belize, &c. The duty (1s. per lb.) paid on it during the last six years, is as follows (*Trade List*):—

In 1834	1893 lbs.	In 1837	1331 lbs.
1835	243	1838	1798
1836	1880	1839	825

Description.—Balsam of Peru (*balsamum peruvianum*) called also *black* or *liquid balsam of Peru* (*balsamum peruvianum nigrum*) is a transparent, deep, reddish-brown or black liquid, which has the consistence of treacle, a powerful but agreeable odour, somewhat similar to that of vanilla and benzoin, and which is increased by dropping the balsam on a red-hot coal, and a warm, acrid, bitter taste. It is inflammable and burns with a fuliginous flame. It is soluble in alcohol; the solution, however, is not clear, but lets fall after some time a deposit. To boiling water it yields its acid (usually stated to be the benzoic, but according to Fremy and others, it appears to be the cinnamonic acid). Its sp. gr. is 1·150 to 1·160.

I have received from Professor Guibourt another balsamic substance under the name of *balsam of Peru in cocoa-nut shells* (*baume du Pérou en cocos*). The shell has the size and shape of a small lemon. The contained balsam is deep brown, and has an odour very similar to that of balsam of Tolu. Guibourt says, "it appears to be formed of two kinds of matter: one more fluid, another more solid, grumous, and as it were crystalline. Its taste is mild and sweetish. It has a strong agreeable odour, between that of Tolu and soft liquidambar, but distinct from both."

The *white balsam of Peru* (*balsamum peruvianum album*) of Martius and other pharmacologists is said, by Guibourt (*op. cit.*), to be the *solid balsam of liquidambar* already described (p. 727).

ADULTERATION.—Balsam of Peru is said to be subject to adulteration; and the formulæ given by Gray (*Suppl. to the Pharm.*) for *making* as well as for *reducing* (*i. e.* adulterating) it, lend support to this opinion. The demand for the balsam being very little, the supply quite equal to or even exceeding the demand, and the price being moderate, are circumstances which appear to remove all motive for adulteration, which I do not think is at present practised in this country. The characters to be attended to in judging of its genuineness are, the purity of its odour, its complete solubility in, or miscibility with, alcohol (by which the absence of fixed oil is shewn), and its undergoing no diminution of volume when mixed with water (by which the absence of alcohol is proved). A sign of its purity is, that 1000 parts of it should saturate 75 parts of pure crystallised carbonate of potash. (Th. Martius, *Pharmakogn.*)

COMPOSITION.—Balsam of Peru has been elaborately investigated by several chemists, and the results obtained are somewhat curious. In 1806 it was examined by Lichtenberg (*Berlin. Jahrb.* 1806, S. 22). Stoltze (*Journ. de Chim. Méd.* i. 139), in 1825, published an analysis of it. Richter (*Pharm. Cent.-Blatt. für* 1838, S. 346), Plantamour (*Ibid.* S. 825, and *für* 1839, S. 601), and Fremy (*Comptes-Rendus*, 1838, Sec. Sem. No. 20, and *Ann. de Chim. et Phys.* t. lxx. p. 180) have since examined the nature of its constituents.

Stoltze's Analysis.		*Fremy's Analysis.*
Brown slightly soluble resin	2·4	1. An oily matter (*cinnaméine*), frequently containing in solution a crystalline substance (*metacinnaméine; hydruret of cinnamyle*).
Brown soluble resin	20·7	2. Cinnamonic acid.
Oil of balsam of Peru [*cinnaméine*]	69·0	3. One or more resins (*hydrates of cinnaméine*).
Benzoic [*cinnamonic*] acid	6·4	
Extractive	0·6	
Loss and moisture	0·9	
Balsam of Peru	100·0	Balsam of Peru.

1. *Oil of Balsam of Peru. Cinnaméine* of Fremy.—If an alcoholic solution of potash be added to an alcoholic solution of balsam of Peru, a compound of resin and potash *(resinate of potash)* is precipitated, while cinnamate of potash and cinnaméine are left in solution. On the addition of water the latter separates, and floats on the surface. It is to be purified by solution in petroleum. Cinnaméine is a reddish-brown, acrid, odourless, oily fluid, heavier than water, soluble in alcohol and ether, insoluble in water, and inflammable. Its composition, according to Fremy, is (taking the average of five experiments), *carbon* 79·0, *hydrogen* 6·26, *oxygen* 14·74. His formula for it, which, however, scarcely accords with this statement, is $C^{54} H^{26} O^{8}$. Caustic potash affects a change on it analogous to saponification, and converts it into two equivalents of cinnamic acid (equal to $C^{38} H^{14} O^{6}$) and a light oily fluid, which Fremy calls *peruvin*, whose composition is, *carbon* 79·6, *hydrogen* 9·3, *oxygen* 11·1, or $C^{18} H^{12} O^{2}$. Cinnaméine frequently (but not invariably) contains in solution a crystalline substance, termed *metacinnaméine*, whose composition is, *carbon* 81·9, *hydrogen* 6·0, *oxygen* 12·1; its formula being $C^{18} H^{9} O^{2}$, so that it is isomeric with *hydret of cinnamyle.*

2. *Cinnamic* or *Cinnamonic Acid.*—This constituent has usually been mistaken for benzoic acid. It is obviously formed in the balsam by the oxidation of the hydret of cinnamyle, just as hydret of benzule is transformed into benzoic acid (see p. 1108). In those balsams of Peru which contain no *metacinnaméine*, this principle has been entirely converted into cinnamic acid.

3. *Resin of Balsam of Peru. Hydrate of Cinnaméine.*—The quantity of resin in balsam of Peru augments daily. It is formed by the union of cinnaméine with the elements of water; for its composition is, *carbon* 71·82, *hydrogen* 6·78, *oxygen* 21·40; or $C^{54} H^{30} O^{12}$. So that this resin consists of one equivalent cinnaméine, and four equivalents of water. It is not, however, formed at once, but gradually undergoing different degrees of viscosity. Soft resin differs from the hard only in its elements of water. Sulphuric acid converts cinnaméine into resin.

Such are the general results of Fremy's analysis; but the correctness of some of them may be fairly called in question. His formulæ do not always agree with his experimental results (see Cinnaméine). Plantamour denies the accuracy of several of Fremy's statements.

Physiological Effects.—Stimulant, slightly tonic, expectorant, detergent, and epulotic. Its action is similar to other balsamic substances (see p. 74), and is closely allied to that of storax (p. 934) and benzoin (p. 938). Topically it operates as a stimulant and mild acrid; and when applied to foul indolent ulcers, often cleanses them, and promotes their cicatrization. Taken internally, in full doses, it creates thirst and quickens the pulse. Its stimulant influence is directed to the secreting organs, especially the bronchial mucous membrane. It is devoid of the powerful influence over the urinary organs, possessed by copaiva and the turpentines, and its tonic powers are not equal to those of myrrh.

Uses.—Its supposed efficacy in curing external ulcers and healing wounds has led to its use in internal diseases, formerly apprehended to depend on ulceration, as in pulmonary affections supposed to be, or which really were, phthisis. But the observations of Dr. Fothergill (*Med. Obs. and Inq.* vol. iv. p. 231) in part led to the discontinuance of the indiscriminate use of balsams and other heating substances in these cases. Yet it proves serviceable in some old asthmatic cases, chronic pulmonary catarrhs, winter coughs, &c. It seems to be principally adapted to *old standing chronic affections of the mucous membranes* (especially the bronchial mucous membrane), particularly in persons of a cold and torpid habit. Its stimulant influence is calculated only to aggravate acute cases.

Many other uses of balsam of Peru are now obsolete: as its employment in lead colic, as recommended by Sydenham; in gonorrhœa and leucorrhœa, by Hoffmann (*Opera omn. Suppl.* p. 736. Genev. 1754); in convulsions from repressed perspiration, by Kirkland (*Treat. on Child-bed Fever*, p. 31, 1774); and externally and internally in traumatic tetanus, by Dr. Kollock (Thacher's *Dispensatory*). It is said to be now and then used in chronic rheumatism. The beneficial effects ascribed by Trousseau and Pidoux to the balsams in chronic laryngitis have been before (p. 74) referred to.

As a topical remedy, balsam of Peru is occasionally employed. It is applied either alone, or in the form of ointment, to indolent, ill-conditioned ulcers: it cleanses them, promotes healthy granulation, and assists cicatrization. I have used it in some obstinate ulcerations about the nose. Dr. Ainslie (*Mat. Ind.* i. 65 and 406) speaks very highly of its powers of arresting the progress of sphacelous and phagedenic affections, so common and destructive in India. He recommends lint, soaked in the balsam, to be applied night and morning. In offensive discharges from the ear it is now and then dropped in after syringing. It is a constituent of some lip-salves. It was formerly esteemed as a vulnerary against wounds of the tendons and nerves. It is used by perfumers for scenting, and in the manufacture of fumigating pastiles.

ADMINISTRATION.—Dose, f℥ss. to f℥j. It may be taken on sugar, or made into pills with some absorbent powder, or diffused through water by means of sugar, gum, or yolk of egg.

Myrosper'mum toluif'erum, Richard, E.—*The Balsam of Tolu-Tree.*

Toluif'era Bal'samum, *Miller, D.*

Sex. Syst. Decandria, Monogynia.

(Concrete balsamic exudation, *E.*—Resina, *D.*)

HISTORY.—The earliest notice of balsam of Tolu is that of Monardes (Clusius, *Exot.* 304). He tells us that the balsam had been recently imported.

BOTANY. *GEN. CHAR.*—See MYROSPERMUM PERUIFERUM.

SP. CHAR.—*Branches* and *leaves* smooth. *Leaflets* oblong, acuminate, equilateral, rounded at the base (D. C.)

The tree which yields the balsam of Tolu was formerly called *Toluifera Balsamum.* But Richard having carefully investigated the characters of the genus Toluifera, found that, with the exception of those of the fruit, which Miller had imperfectly described, they were identical with those of the genus now called Myrospermum; and as Ruiz states that the balsams of Peru and Tolu are both obtained from one tree, the *Myrospermum peruiferum* has been adopted by several writers, and by the London College, as the source of both balsams.

Richard (*Ann. Scien. Nat.* t. ii. p. 168) found specimens of the trees yielding these balsams in Humboldt's herbarium; and though he at first mistook them for the same species, he has subsequently recognized them to be different. He therefore made a distinct species of the tree yielding the balsam of Tolu, and it is now called *Myrospermum toluiferum.* It differs from M. peruiferum in its having thin, membranous, obovate leaflets, which are lengthened and acuminated at their summits. Moreover, the terminal leaflet is larger than the lateral ones.

HAB.—Mountains of Tolu, Turbaco, and on the banks of the Magdalena, between Garapatas and Monpox.

PRODUCTION.—Balsam of Tolu is procured by making incisions into the bark of the tree, and receiving the liquid balsam in vessels made of a black wax. It is afterwards transferred into proper vessels. It only exudes from the tree during the heat of the day (Monardes, *op. cit.* 304).

COMMERCE.—Balsam of Tolu is sometimes brought direct from Carthagena, Santa Martha, and Savanilla; more commonly, however, it comes by way of New York or Jamaica. It is usually imported in cylindrical tin canisters; now and then in earthen pots or jars, still more rarely in small calabashes.

DESCRIPTION.—Balsam of Tolu (*balsamum tolutanum* vel *de Tolu*), when first brought over, is generally soft and tenacious, but by age becomes hard and brittle, somewhat similar to resin, and has a granular or somewhat crystalline appearance. Formerly it was imported in this hardened state, but is now usually met with in the soft state. It is transparent, has a reddish or yellowish-brown colour, a most fragrant odour, though less powerful than that of storax or Peruvian balsam, and a pleasant sweetish taste. It softens under the teeth; when heated readily melts, takes fire, and burns with an agreeable odour. It is very soluble in alcohol and ether, and gives out its acid to water. The soft balsam contains more oil but less acid than the dry balsam, the acid and the resin being formed at the expense of the oil. Balsam of Tolu hardens or resinifies with much more facility than balsam of Peru.

Balsam of Tolu in calabashes (*balsamum tolutanum in cucurbitis par-*

vis, Dale) occurs in calabashes (the fruit of *Crescentia Cujete*, according to Sloane, *Hist. Nat. Jamaica*, ii. 174) about the size of an orange; the large aperture by which the balsam has been introduced being closed with the rachis of the fruit of *Zea Mays*.

Composition.—According to Fremy (*Ann. de Chim. et Phys.* t. lxx. p. 201), the composition of balsam of Tolu is similar to that of balsam of Peru, its constituents being *cinnaméine, cinnamic acid*, and *resin.* They differ, according to the same chemist, from those of balsam of Peru by the great facility with which they become resinified.

Resin of Balsam of Tolu.—Is essentially the same as that of balsam of Peru, and, like it, also forms a fine red colour with sulphuric acid; but it is less fusible than the resin of the last-mentioned balsam. It consists of *carbon* 70·8, *hydrogen* 6·1, and *oxygen* 23·1; so that it contains a larger proportion of the elements of water.

Physiological Effects and Uses.—The effects of balsam of Tolu are similar to those of balsam of Peru (see p. 1132), and the other balsamic substances (p. 74). It is employed as a stimulating expectorant in chronic bronchial affections, unaccompanied with inflammatory action. It is, however, more frequently used as an agreeable flavouring adjunct to pectoral mixtures. The vapour of the ethereal solution of the balsam has been inhaled in chronic affections with benefit. *Tolu lozenges* form a popular and pleasant remedy for appeasing troublesome cough. The balsam is sometimes employed by confectioners to flavour *sweetmeats*, as marmalade. It is also used *in perfumery;* and is a constituent of some *fumigating pastiles* (see p. 938).

Administration.—The dose of the balsam is from grs. x. to ʒss. It may be taken in the form of an *emulsion*, made with gum or sugar. It is a constituent of the *compound tincture of benzoin*, L. D. (pp. 938-9).

1. *Tinctura Balsami Tolutani*, L. D. *Tinctura Tolutana*, E. *Tincture of Tolu.* (Balsam of Tolu, ℥ij. [℥j. *D.*, in coarse powder, ℥iss. E.]; Rectified Spirit, Oij. [Oj. wine measure, *D.*, f℥xvj. *E.*] Digest [with a gentle heat, *E.*, in a close vessel, *D.*] until the balsam is dissolved [and filter, *L. D.*]).—A stimulating expectorant, principally used as a flavouring adjunct to other pectorals. Its use is, of course, objectionable in inflammatory cases. Dose, fʒss. to fʒij. When mixed with water the resin is precipitated; hence it should be rubbed with mucilage, or some viscid liquor, before adding the water, to keep the resinous precipitate in suspension.

2. *Syrupus Tolutanus*, L. D. *Syrupus Balsami Tolutani*, D. *Syrup of Tolu. Balsamic Syrup.* (Balsam of Tolu, ʒx.; Boiling Water, Oj.; Sugar, lbs. ijss. Boil the Balsam in the Water for half an hour in a vessel lightly covered, frequently stirring, and strain the cooled liquor; then add the Sugar, and dissolve it, *L.*—Simple Syrup, Oij. [Oiss. *D.*]; Tincture of Tolu, ℥j. When the syrup has been recently prepared, and has not altogether cooled, add the tincture of Tolu by degrees, agitating briskly, *E. D.*)—Employed as an agreeable flavouring adjunct to pectoral mixtures. Dose, fʒj. to fʒiv.

Cyt'isus scopa'rius, Decandolle, L. E.—*Common Broom.*

Spar'tium scopa'rium, *Linn. D.*

Sex. Syst. Diadelphia, Decandria.

(Cacumina recentia, *L.*—Tops, *E.*—Cacumina, *D.*)

History.—It is uncertain who first mentioned this plant. The σπάρτιον of Dioscorides (lib. iv. cap. 158) is *Spartium junceum* or *Spanish Broom* (Smith, *Prodr. Fl. Græc.* ii. 53). The *Genista* of Pliny (*Hist. Nat.* lib. xxiv. cap. 40, ed. Valp.) was probably the same plant, though the Roman historian was himself doubtful whether this plant was identical with that of the Greeks. Sprengel (*Hist. Rei Herb.* i. 80) considers that Theophrastus was undoubtedly acquainted with Common Broom.

Botany. *Gen. Char.*—*Calyx* two-lipped; the upper lip generally entire, the lower one somewhat three-toothed. *Vexillum* ovate, large; *keel* very obtuse, enclosing the stamens and pistils. *Stamens* monadelphous. *Legume* plano-compressed, many-seeded, without glands.—*Shrubs. Leaves* trifoliate (D. C.)

Sp. Char.—*Branches* angular, smoothish. *Leaves* trifoliate, stalked. *Tops* simple. *Leaflets* oblong. *Flowers* axillary, stalked, solitary. *Legumes* hairy at the margin (D. C.)

A *shrub*, three to six feet high. *Branches* long, straight, and green. *Leaves* deciduous; upper ones generally simple. *Flowers* large, bright yellow; *keel* broad; *vexillum* and *alæ* much spreading. *Legumes* large, dark-brown, containing fifteen or sixteen *seeds*.

Hab.—Indigenous; growing on dry hills and bushy places. Flowers in June.

Description.—Broom-tops (*scoparium; cacumina scoparii*) have a bitter, nauseous taste, and, if fresh, a remarkable odour when bruised.

Composition.—The *flowers* of broom contain, according to Cadet de Gassicourt (*Journ. de Pharm.* x. 448), *concrete volatile oil, fatty matter, wax, chlorophylle, yellow colouring matter, tannin, a sweet substance, mucilage, ozmazome, albumen*, and *woody fibre*. The *ashes* amounted to 5·75 per cent., and contained 29 per cent. of carbonate of potash, besides chloride of potassium, sulphate of potash, chloride of calcium, nitrate, phosphate, and sulphate of lime, carbonates of lime, magnesia, and iron, and silica.—*Salt of broom*, or *sal genistæ*, is obtained by burning the whole plant. It contains a large proportion of carbonate of potash. Hill (*Hist. of the Mat. Med.* 397) says, that a pound of the green twigs, with the leaves and flowers, yields a drachm and a half of this salt.

Physiological Effects. (*a.*) *On animals generally.*—In some parts of Europe broom is employed as winter food for sheep; and Withering says that it prevents the disease called rot, and is salutary in dropsy, to which sheep are liable. According to Loudon, it is apt to produce disease of the urinary organs, to prevent which a plentiful use of water is recommended.

(*b.*) *On man.*—*In large doses* broom-tops are an emetic and purgative. *In smaller doses* they are diuretic and mildly laxative. As a diuretic they have been celebrated by Mead and Cullen.—“Though very little in use,” says Dr. Cullen (*Mat. Med.*), “I have inserted this in my catalogue from my own experience of it. I found it first in use among our common people; but I have since prescribed it to some of my patients in the manner following:—I order half an ounce of fresh broom-tops to be boiled in a pound of water till one-half of this is consumed, and of this decoction I give two table spoonfuls every hour, till it operates by stool and urine; and by repeating this exhibition every day, or every second day, some dropsies have been cured." Having very frequently employed broom in dropsies, I can add my testimony to its powerful effects as a diuretic: I cannot call to mind a single case in which it has failed to act on the kidneys. In some cases it produced a most marked and beneficial effect on the dropsical effusion. According to my experience, it is more certain than any other diuretic in dropsies. Dr. Pearson (*Observ. on Broom-seed*, 1835) terms broom a *tonico-diuretic*; and says it improves the appetite, and invigorates the whole system.

Uses.—It has been principally or solely employed in dropsies, and, as already mentioned, sometimes with great benefit. Of course its chance of cure depends on the nature of the cause of the dropsical effusion. In acute inflammatory cases, as well as in diseased kidney, its use might be objectionable. It is said also not to be adapted to thoracic dropsy, especially when combined with pulmonary congestion, or any degree of inflammatory affection of the chest.

Administration.—Broom-tops are usually given in the form of *infusion* or *decoction*. The *seeds*, which keep much better than the tops, and on that account have an advantage over the latter, may be used in the form of powder, in doses of grs. x. to grs. xv. in mint water or cold ginger tea; or in the form of tincture (see *Spartium junceum*). To promote the operation of broom, diluents should be freely given.

1. *Infusum Scoparii*, L. *Broom Tea*. (Scoparium, ℥j.; Boiling Distilled Water, Oj. Macerate for four hours in a lightly covered vessel and strain).—*A decoction* is to be preferred to the infusion. Dose, as a diuretic in dropsy, f℥j. to f ij.

2. *Decoctum Scoparii compositum*, L. *Decoctum Scoparii*, E. (Scoparium, Juniper fruit, Dandelion, of each ʒss.; Distilled Water, Oiss. Boil down to a pint, and strain, *L.*—Broom-tops, and Juniper-tops, of each ℥ss.; Bitartrate of Potash, ʒiij.; Water, Oiss. Boil them down together to a pint, and then strain, *E.*)—Diuretic and laxative. Dose, f℥j. to f℥ij.

3. *Extractum Spartii Scoparii*, D. (Prepared by the evaporation of the decoction of the tops)—Diuretic and laxative. Employed only as a diuretic in dropsy. Dose, ʒss. to ʒj. Rarely used.

Glycyrrhi'za gla'bra, Linn. L. E. D.—*Common Liquorice*.

Sex. Syst. Diadelphia, Decandria.

(Radix recens, *L.*—Root. Extract of the Root, *E.*—Radix, *D.*)

History.—The γλυκύῤῥιζα of Hippocrates and of Dioscorides (lib. iii. cap. 7) are doubtless identical; the latter is supposed by Sprengel (*Hist. Rei Herb.* i.) and others to be our *Glycyrrhiza glabra*; by Dierbach (*Arzneim. d. Hippocrates*) to be *G. glandulifera*, but by Dr. Sibthorp (*Prodr. Fl. Græcæ*, ii. 77) it is said to be the *G. echinata*, which is now termed in Greece γλυκόριζα.

Botany. *Gen. Char.*—*Calyx* naked, tubular, five-cleft, two-lipped: with the two upper lobes united more than the others. *Vexillum* ovate-lanceolate, straight; *keel* two-parted or two-petalous, straight, acute. *Stamens* diadelphous. *Style* filiform. *Legume* ovate or oblong, compressed, one-celled, one- to four-seeded.—Perennial *herbs* with extremely sweet *roots*. *Leaves* unequally-pinnated. *Racemes* axillary. *Flowers* blue, violet, or white (D. C.)

Sp. Char.—*Leaflets* ovate, slightly retuse, viscid beneath. *Stipules* none. *Spikes* pedunculated [i. e. *racemes*], shorter than the leaves. *Flowers* distant. *Legumes* smooth, three- or four-seeded (D. C.)

Stem erect, smooth, four or five feet high. *Leaflets* yellowish-green. *Flowers* papilionaceous, bluish or purplish.

Hab.—South of Europe. Cultivated at Mitcham in Surrey and at other places, for medicinal use.

Description.—The underground stem is denominated *liquorice-root* (*radix glycyrrhizæ* seu *liquoritiæ*) or *stick liquorice*. It is in long cylindrical pieces, about the thickness of the finger. Externally it is grayish-brown, internally yellow. Its odour is rather sickly and earthy: its taste remarkably sweet.

Composition.—Liquorice root (*G. glabra*) was analyzed by Robiquet in 1809 (*Ann. de Chim.* lxxii. 143). Trommsdorf (Gmelin, *Handb. d. Chem.* ii. 1261) analyzed the root of *G. echinata*. The constituents of the fresh root of *G. glabra* are, according to Robiquet, *glycyrrhizin, starch, asparagin, resinous oil, albumen, woody fibre, and salts* (phosphate and malate of lime and magnesia).

1. *Glycyrrhizin* (*Glycion* or *Liquorice Sugar.*)—Belongs to the uncrystallizable sugars which are not susceptible of vinous fermentation (see p. 584). It is characterized by its affinity for acids, with which it unites to form compounds which are very slightly soluble only in water. It is yellow and transparent, and has the sweet taste of the root. It is soluble in both water and alcohol. Acids precipitate it from its solution. It combines also with bases, as well as with salts. It causes precipitates with many metallic solutions.

2. *Resinous oil.*—To this constituent, liquorice root owes the slight degree of acridity which it possesses.

Physiological Effects.—Liquorice root and its extract are emollient, demulcent, and nutritive.

Uses.—Employed as an emollient and demulcent in catarrhal affections of the mucous membranes. It is also used as a flavouring adjunct to other medicines. Its powder is employed in the preparation of pills, either to give them a proper consistence, or to prevent their adhesion.

Administration.—For medicinal use the root should be *decorticated*, as the epidermis possesses a slight degree of acridity.

1. *Decoctum Glycyrrhizæ*, D. (Liquorice Root, bruised, ℥iss.; Water, Oj. Boil for ten minutes, and strain).—An agreeable demulcent: used as a vehicle for other medicines.

2. *Extractum Glycyrrhizæ*, L. E. D. (Prepared as Extract of Gentian, *L. D.*—Cut liquorice-root into small chips, dry it thoroughly with a gentle heat, reduce it to a moderately fine powder, and proceed as for extract of Gentian, *E.*)—Extract of liquorice is extensively imported under the name of *liquorice juice*, or, according to the countries from where it is brought, *Spanish* or *Italian juice*. *Solazzi juice* is most esteemed. The Spanish extract is prepared in Catalonia from *G. glabra*; while the Italian extract is obtained in Calabria from *G. echinata* (Fée, *Cours d'Hist. Nat.* ii. 24). In 1839 there were imported 4059 cwts. of

foreign extract of liquorice, the duty on which is £3. 15s. per cwt. It comes in cylindrical or flattened rolls of five or six inches long, and about one inch in diameter, and enveloped in bay leaves. When pure it is black and dry, with a glossy fracture and a sweetish taste; and is completely soluble in water. As met with in commerce, however, it is rarely pure. Neumann (Works, by Lewis, p. 425) obtained 460 of watery extract from 480 of Spanish liquorice. It contains the soluble principles of the root, with some copper scraped off the boiler by the spatula employed to stir the extract during its preparation. Fée says, that four pounds of this extract yield two drachms and a half of metallic copper; but I suspect there must be some mistake in this statement. If the foreign extract be dissolved in water and the solution filtered and inspissated we obtain *refined liquorice*. But I am informed that the *pipe refined liquorice* of the shops is a very adulterated article. The *Pontefract lozenges* are made of refined liquorice, and are much esteemed. Another preparation has been recently introduced under the name of the *quintessence of liquorice*. Extract of liquorice is dissolved slowly in the mouth, to appease tickling cough. It is a very agreeable flavouring adjunct to other medicines. As it easily becomes soft by warmth it does not answer well as a pill-basis.

3. *Trochisci Glycyrrhizæ*, E. (Extract of liquorice; Gum Arabic, of each ℥vi.; Pure Sugar, lb. i. Dissolve them in a sufficiency of boiling water; and then concentrate the solution over the vapour-bath to a proper consistence for making lozenges.)—Employed in tickling cough and irritation of the fauces.

Astrag'alus, Decandolle.—*Milk Vetch.*

A. ve'rus, Olivier, L.
A. ve'rus and other species, E.
A. cre'ticus, Lamarck, D.

Sex. Syst. Diadelphia, Decandria.

(Succus concretus, *L.*—Gummy exudation, *E.*—Gummi, *D.*)

History.—Dr. Sibthorp (*Prodr. Fl. Græc.* ii. 90) states, that the τραγάκανθα of Dioscorides (lib. iii. cap. 23) is the *Astragalus aristatus*, which in the Peloponnesus is still called τραγακάνθα, and whose gum is annually sent to Italy.

Botany. *Gen. Char.*—*Calyx* five-toothed. *Corolla* with an obtuse keel. *Stamens* diadelphous. *Legume* two-celled, or half two-celled by the lower [dorsal] suture being turned inwards.—*Herbs* or *shrubs* (D.C.)

Species 1. *A. verus.*—*Flowers* axillary, in clusters of two to five, sessile. *Calyx* tomentose, obtusely five-toothed. *Leaflets* eight to nine pairs, linear, hispid (D. C.)—A small *shrub. Branches* covered with imbricated scales and spines, the remains of former petioles. *Flowers* yellow, papilionaceous.—Persia. According to Olivier the Tragacanth of Asia Minor, Armenia, and Northern Persia, forming the greater part of that of Europe, is yielded by this species.

2. *A. gummifer.*—*Flowers* three to five axillary, sessile. *Calyx* five-cleft, together with the legumes woolly. *Leaflets* four to six pairs, oblong-linear, smooth (D. C.)—Lebanon. According to La Billardière this species yields Tragacanth.

3. *A. creticus.*—*Flowers* axillary, sessile, clustered. *Calyx* five-partite, with feathery, setaceous lobes rather longer than the corolla. *Leaflets* five to eight pairs, oblong, acute, tomentose (D. C.)—Mount Ida, in Crete, where it yields Tragacanth, according to Tournefort.

Fig. 210.

Astragalus creticus.

Production.—Tragacanth is a natural exudation from the stem of the before-mentioned plants. The cause of the exudation of this as of other gums, is thus explained by Decandolle (*Phys. Vég.* t. i.) The gummy matter of the stem resides in the bark and alburnum; it is the nutritive juice of the plant; and its escape, therefore, is analogous to hemorrhage in animals: hence plants in whom it spontaneously occurs are always in a sickly state. The mechanical cause of the expulsion of this juice is dependent on the unequal hygrometric properties of the different parts of the stem. The wood absorbs more moisture from the air than the bark, and hence it swells more. In consequence of its enlargement, it distends the bark, which, by the internal pressure of the wood, gives way, and the gummy matter escapes. This explanation is quite in conformity with facts mentioned by La Billardière,—that tragacanth flows only in abundance during the night, and a little after sunrise. A cloudy night, or a heavy dew, is, he thinks, necessary for its production; for the shepherds of Lebanon only go in search of this substance when the mountain has been covered during the night with thick clouds.

Description.—Tragacanth (*gummi tragacantha*) is frequently called in the shops *gum dragon*. It is white, yellowish, or yellowish-brown, hard, tough, odourless, tasteless, swelling considerably in water, and forming a thick, tenacious mucilage. Two kinds of it are known.

1. *Flaky Tragacanth: Smyrna Tragacanth* (Martius): *Tragacanth of the Astragalus verus?*—This is the tragacanth usually found in English commerce. It occurs in moderately large, broad, thin pieces, marked with arched or concentric elevations.

2. *Vermiform Tragacanth: Morea Tragacanth* (Martius): *Tragacanth of the Astragalus creticus?*—This variety is rarely met with in this country, but is common on the continent. It occurs in small, twisted, filiform, spiral pieces. There is more starch in it than in the first variety.

Commerce.—Tragacanth is imported in cases and chests from Smyrna and other ports of the Levant. In 1839, duty (6s. per cwt.) was paid on 87 cwts.

Composition.—The *ultimate* analysis of tragacanth has been made by Hermann and by Guerin-Varry (*Journ. de Chim. Méd.* vii. 742).

	Hermann's Analysis.			*Guerin-Varry's Analysis.*	
	Atoms.	*Eq. Wts.*	*Per cent.*	*Soluble part.*	*Insoluble ditto.*
Carbon	10	60	40·50	42·01	35·79
Hydrogen	10	10	6·61	6·42	7·11
Oxygen	10	80	52·89	54·57	57·10
Tragacanth gum	1	150	100·00	103·00	100·00

In 1805, Vauquelin (*Ann. Chim.* liv. 312) made an examination of the *proximate* constituents of tragacanth. In 1815, Bucholz (Gmelin, *Handb. d. Chem.* ii. 779), and in 1831 Guerin-Varry (*op. supra cit.*) published proximate analyses of this gum.

Bucholz's Analysis.		*Guerin-Varry's Analysis.*	
Common gum	57	Arabin	53·30
Bassorin	43	Bassorin and starch	33·10
		Water	11·10
		Ashes	2.50
Gum Tragacanth	100	Gum Tragacanth	100·00

1. *Tragacanthin. Adragantin. Soluble gum* or *arabin* of Tragacanth.—The soluble gum of tragacanth is usually regarded as similar to gum Arabic, and hence it is called arabine; but it is distinguished by silicate of potash and perchloride of iron producing no change in it, and by a peculiar appearance of the precipitate produced with alcohol (the precipitate is flocculent, and collects in a simple opaque, and mucous mass.)—In common with arabine it produces precipitates with diacetate of lead, protochloride of tin, and protonitrate of mercury. Oxalate of ammonia detects in it a calcareous salt.

2. *Bassorin. Insoluble gum of Tragacanth.*—The insoluble part of gum tragacanth is similar to that of gum Bassora, and hence is called *Bassorin*. It swells up in water.

3. *Starch.*—Starch globules may be detected in the bassorin (when swollen up by water) both by the microscope and by iodine.

According to Guibourt (*Hist. des Drog.* ii. 477) tragacanth contains neither arabine nor bassorine, but is essentially formed by an organized gelatiniform matter, very different to gum Arabic both in its physical and its chemical properties, and which swells and divides in water, so as in part to pass through a filter. The insoluble part of tragacanth is, according to the same authority, a mixture of starch and lignin, which has nothing in common with bassorine. Decandolle suggests that the insolubility and swelling of tragacanth in water may arise from the gummy matter being contained in cells.

Physiological Effects.—Like other gums, tragacanth is emollient, demulcent, and nutritive; but difficult of digestion.

Uses.—Tragacanth, in powder, is used rather as a vehicle for active and heavy medicines (as calomel), than on account of its own proper effects. It is occasionally, however, taken as a sheathing or demulcent agent in irritation of the mucous membranes.

Administration.—Dose of the powder, ℈ss. to ʒij.

1. *Pulvis Tragacanthæ compositus*, L. E. (Tragacanth, bruised; Gum Arabic, bruised; Starch, of each ℥iss.; Pure Sugar, ℥iij. Rub the Starch and Sugar together to powder, then having added the Tragacanth and Gum Arabic, mix them together).—Employed as a vehicle for the exhibition of active and heavy powders to children. Dose for an adult ʒss. to ʒj.

2. *Mucilago Tragacanthæ*, E. *Mucilago Gummi Tragacanthæ*, D. (Tragacanth, ʒij.; Boiling Water, f℥ix. "Macerate for twenty-four hours, then triturate to dissolve the gum, and express through linen or calico," *E.*—The *Dublin College* directs the powdered gum to be used, and employs f℥viij. of water. Maceration is to be effected in a close vessel, until the gum is dissolved, and the mucilage then strained).—Employed in making pills and lozenges; also to suspend heavy powders, as the metallic oxides, in water. It has also been recommended as an application to burns.

Mucu'na pru'riens, Decandolle, L. E.—*Common Cowhage* or *Cow-itch.*

Dol'ichos pru'riens, *Linn. D.*—Stizolo'bium pru'riens, *Persoon.*

Sex. Syst. Diadelphia, Decandria.

(Leguminum Pubes, *L.*—Hairs from the Pod, *E.*—Pubes Leguminis, *D.*)

History.—One of the earliest writers who mentions this plant is Ray (*Hist. Plant.* vol. i. p. 887). It was long confounded with the *M. prurita*, Hooker.

Botany. *Gen. Char.*—*Calyx* campanulate, two-lipped; the lower lip trifid, with acute segments, the middle one the longest; the upper lip broader, entire, obtuse. *Vexillum* ascending, shorter than the alæ and keel; *alæ* oblong, as long as the keel; *keel* oblong, straight, acute. *Stamens* diadelphous; *anthers* ten, of which five are oblong-linear and five ovate, hirsute. *Legume* oblong, knotted, two-valved, with cellular partitions. *Seeds* roundish, surrounded by a circularly linear hilum.—Twining *herbs* or *shrubs*. *Leaves* pinnately trifoliate. *Racemes* axillary. *Legumes* usually hispid and stinging, by the innumerable very brittle hairs which readily penetrate the skin (D. C.)

Sp. Char.—*Flowers* in racemes. *Legumes* stinging, with somewhat keeled valves. *Leaflets* hairy beneath, acuminate; the middle one rhomboidal, the lateral ones dilated externally (D. C.)—*Root* perennial. *Stem* herbaceous. *Flowers* with a disagreeable alliaceous odour; *vexillum* flesh-coloured; *alæ* purple or violet; *keel* greenish-white.

Hab.—West Indies.

Mucuna prurita, Hooker (*Bot. Miscell.* ii. 348).—A native of the East Indies; has been usually confounded with the American *M. pruriens;* but is distinguished by its smaller leaves, its more obtuse (not acuminated) *leaflets*, the middle one being more truly rhomboidal; its *flowers* more constantly in threes, and by its *legumes* being greatly broader, compressed, free from any raised line on the back of the valve; whilst in the American *M. pruriens* the pods are much narrower, terete, and keeled on the valves.

Description.—*Cowhage* or *Cow-itch* (*siliqua hirsuta*) is the legume of the Mucuna pruriens (*legumen mucunæ, stizolobii,* vel *dolichos pruritentis*). It is of a brownish colour, is shaped like the letter ʃ, about four or five inches long, contains from four to six seeds, and is clothed with strong, brown, bristly, stinging hairs (*pubes leguminis; setæ siliquæ hirsutæ*), which, examined by the microscope, appear like porcupines' quills, but are slightly notched or serrated towards the point.

Composition.—The hairs contain tannin (Martius, *Pharmakogn.*)

Physiological Effects.—A decoction of the root or of the legumes is said to be diuretic, and was formerly used in dropsy (Browne, *Jamaica*, p. 291). The setæ applied to the skin produce intolerable itching, and in some persons pain, redness, swelling, and even an eruption. These effects, which are increased by rubbing, but diminished by the application of oil, are referrible to the mechanical properties of the setæ.

Uses.—The setæ have been celebrated for their anthelmintic properties. Their action is supposed to be mechanical; that is, they are supposed to pierce and torment intestinal worms, and thereby to oblige them to let go their hold. In support of this explanation, Mr. Chamberlaine (*Pract. Treat. on Stizolobium* or *Cowhage*, p. 57, 9th edit. 1804) tells us he sprinkled some of the hairs in a calabash full of very large round worms

(Ascaris lumbricoides), and that in a little time the animals began to writhe and twist about, evincing thereby extreme torture. On examining them with a magnifying glass, the hairs were found sticking loosely in various parts of their bodies. Their usual want of action on the internal coat of the intestines is ascribed to the mucous secretion which defends the subjacent membrane from injury. In one case diarrhœa followed the use of a very large dose of the electuary, and in another instance enteritis came on, after taking this preparation once; but it is not certain that these were the consequences of the operation of the hairs (Chamberlaine, *op. cit.* p. 65).

Cowhage has been principally celebrated for expelling the large round worm (*Ascaris lumbricoides*), and the small thread-worm (*A. vermicularis*). It has not proved equally serviceable against the tape-worm (*Tænia Solium*).

Administration.—The best mode of exhibiting the setæ is in treacle, syrup, or honey. The quantity of hairs should be sufficient to give the syrup, or treacle, the consistence of honey, or of an electuary; and of this mixture a tea-spoonful may be given to children, and a table-spoonful to adults: this dose should be taken twice a day—namely, at going to bed, and in the morning an hour before breakfast. Chamberlaine says it usually operates more effectually where a gentle emetic has been premised. After continuing the electuary for three or four days, a brisk purgative of jalap, or senna, should be taken, which will in general bring away the worms.

Pterocar'pus santali'nus, Linn. L. E. D.—*Three-leaved Pterocarpus.*

Sex. Syst. Diadelphia, Decandria.

(Lignum, *L. D.*—Wood, *E.*)

History.—Avicenna (*Canon.* lib. ii. tract. ii. cap. 656) mentions red sandal wood (*sandalus rubeus*). Garçias (Clusius, *Exot.* 173) thinks the term *sandal* is a corruption of *chandama*, the name by which the wood is known in Timor.

Botany. *Gen. Char.*—*Sepals* five, cohering to form a five-toothed calyx. *Petals* five, forming a papilionaceous corolla. *Stamens* ten; the *filaments* variously combined. *Legume* indehiscent, irregular, somewhat orbicular, surrounded by a wing, often varicose, one-seeded. *Cotyledons* thick, incurved; *radicle* somewhat inflexed at the base of the embryo.—Unarmed *trees* or *shrubs*. *Leaves* unequally pinnated (D. C.)

Sp. Char.—Arboreous. *Leaflets* three (rarely four or five?), roundish retuse, glabrous. *Racemes* axillary, simple or branched. *Petals* long-clawed, all waved or curled on the margins. *Stamens* combined into a sheath, split down to the base on the upper side, and halfway down on the lower. *Legume* long-stalked, surrounded by a broad, membranous wing, obtuse at the base, one- or rarely two-seeded (Wight and Arnott).

A lofty *tree*. *Flowers* yellow with red veins.

Hab.—Mountains of Coromandel and Ceylon.

Description.—*Red Sandal* or *red Sander's wood* (*lignum santali rubri*, *lignum santalinum rubrum*) is imported in roundish or somewhat angular billets, which are blackish externally, but of a blood-red internally. It is compact, heavy, of a fibrous texture, but is capable of taking a fine polish; almost tasteless, and inodorous, except when rubbed, when it emits a feeble smell. It scarcely communicates colour to water. Alcohol, as well as alkaline solutions, readily extract the colouring matter. The alkaline solution is violet-red, and forms a precipitate (*santalin*) on the addition of acids. The alcoholic solution produces precipitates with several metallic solutions: thus, violet with solutions of lead, scarlet with bichloride of mercury, and deep-violet with sulphate of iron.

COMPOSITION.—Red sandal wood was analyzed by Pelletier (*Journ. Phys.* lxxix. 268), who found in it a *peculiar colouring matter*, which he called *santalin* (about 16·75 per cent.), *extractive, gallic acid*, and *woody fibre.*

Santalin is dark-red, with a resinous appearance; almost insoluble in water, but soluble in alcohol, alkaline solutions, ether, acetic acid, and slightly so in some of the volatile oils (as the oil of lavender and rosemary). The effects produced on its alcoholic and alkaline solutions by salts, &c. are similar to those above mentioned on the tincture of the wood. The composition of santalin is *carbon* 75·03, *hydrogen* 6·37, *oxygen* 18·6; or $C^{16} H^8 O_3$.

USES.—It is employed in medicine as a colouring agent. (See *Tinctura Lavandulæ composita*, p. 827).

Pterocar'pus erina'ceus, Lamarck, L. E.—*The Hedgehog Pterocarpus.*

Sex. Syst. Diadelphia, Decandria.

(Extractum, *L.*—Kino. Concrete exudation of this and other undetermined genera and species, *E.*—Kino [plant yielding it unnamed], *D.*)

HISTORY.—In 1757 Dr. Fothergill (*Med. Obs. and Inq.* i. 358, 4th ed. 1776) described an astringent gum, which he supposed (though on very loose evidence) to have been brought from the river Gambia; and hence he termed it *gummi rubrum astringens gambiense.* In 1774 it was introduced into the Edinburgh Phamacopœia as *gummi kino;* and in 1787 into the London Pharmacopœia as *resina kino.* It was described, under this designation, in the third edition of Lewis's *Exp. Hist. of the Mat. Med.*, by Dr. Aikin, in 1784. In 1794, Schenck (*Coll. Diss. med. Marburg.* t. v.) published an inaugural dissertation on it. I have not been able to ascertain why it was called kino; nor can the precise nature of the substance referred to be now ascertained. Several years since I accidentally met with, in the warehouse of an old drug firm in London, a substance marked *gummi rubrum astringens*, which I was told had formerly fetched a very high price. It has subsequently proved to be *Butea gum.* I was at first inclined to believe that it was the original astringent gum of Fothergill, and it has been described by Professor Guibourt (*Hist. des Drog.* ii. 428, 3me ed.) as *gomme astringente de Gambie.* But a more attentive perusal of Fothergill's paper has led me to doubt their identity (see *Butea gum*). It is somewhat remarkable, however, that the Hindu name for Butea gum is *kueni* or *kuenee.* Is this the source of the European term *kino?*

BOTANY. *GEN. CHAR.*—See PTEROCARPUS SANTALINUS.

SP. CHAR.—*Leaflets* alternate, elliptical, obtuse, smooth above, rufous-pubescent beneath. *Fruit* with a very short, lateral, straight point (D. C.)

Middling-sized *tree.* *Leaves* deciduous. *Flowers* papilionaceous, numerous, yellow.

HAB.—Woods of the Gambia; Senegal.

Extraction of the juice of Pterocarpus erinaceus.—"When an incision is made" in the trunk and branches of the tree, "the juice flows out, at first, of an extremely pale-red colour, and in a very liquid state; but it soon coagulates, becoming of a deep blood-red hue, and so remarkably brittle, that its collection is attended with some difficulty" (Gray, *Trav. in Western Africa,* in Stevenson and Churchill's *Med. Bot.*)

Commerce of Kino.—Two substances are met with in English commerce under the name of kino,—one called *Botany Bay Kino*, which is the inspissated juice of the *Eucalyptus resinifera* (see p. 1098)—the other, apparently an extract, imported from Bombay and Tellicherry, and which may be termed *East Indian kino.* The latter is presumed to be the substance referred to in the British pharmacopœias, as it is always regarded in commerce as *genuine gum kino.* It is imported in boxes.

In my museum I have several other substances, apparently extracts, which I have received as *kino*, mostly from Professor Guibourt, who has described several of them in his *Hist. des Drog.* ii. 428). One of these is, perhaps, *Jamaica kino* (see p. 824). A second I received as *Colombian kino.* A third I believe to be *foreign extract of rhatany.* I have never met them in English commerce, and therefore think it needless to describe them.

Description.—*East Indian kino* (*kino indicum* seu *ostindicum*), sometimes called *Amboyna kino* (*kino amboinense*), and usually known in the shops as *gum kino* (*kino*, Ph. L. E. D.) occurs in small, angular, glistening fragments, the larger of which appear almost black, the smaller being reddish. When entire they are opaque, but in thin laminæ are transparent and ruby-red. They are brittle between the fingers, soften in the mouth, stick to the teeth, and colour the saliva red. They are inodorous, but have a very astringent taste. Both water and alcohol acquire, by digestion on kino, a deep red colour. The aqueous decoction becomes turbid on cooling. The mineral acids and solutions of gelatine, emetic tartar, acetate of lead, sesquichloride of iron, nitrate of silver, &c. produce precipitates with the watery infusion.

The tree yielding East Indian kino is as yet unascertained. It is probably a native of the Malabar coast, for all the importations of East Indian kino which I can trace were from Bombay or Tellicherry; and an experienced East India broker assures me it is the produce of the Malabar coast. As Pterocarpus erinaceus is not known to grow in India, there is no ground for ascribing East Indian kino to that species. Is it the produce of Pterocarpus marsupium, which, Dr. Roxburgh (*Fl. Ind.* iii. 235) says, yields an astringent inspissated juice exceedingly like Butea gum?

Composition.—East Indian kino was analyzed by Vauquelin (*Ann. de Chim.* xlvi. 321), who found its constituents to be as follows:—*tannin* and *peculiar extractive* 75, *red gum* 24, *insoluble matter* 1. A. W. Buchner (*Pharm. Central-Blatt. für* 1833, S. 629 & 652) has subsequently shown that *catechuic acid* is a constituent of kino. To this acid, which has been before (p. 1027) noticed, kino owes its power of communicating a green colour to the salts of iron.

Physiological Effects.—Astringent (see pp. 79-80). Less effective, and less readily dissolved in the alimentary juices, than catechu, to which in its operation it is otherwise closely allied.

Uses.—Employed in medicine as an astringent only; principally in obstinate chronic *diarrhœa.* In this disease it is usually given in combination with chalk, and frequently with opium. In *pyrosis* the compound powder of kino (*i. e.* opium and kino) has been found serviceable. Dr. Pemberton (*Diseases of the Abdom. Viscera*) ascribes to kino a power of restraining the discharge of the mucous glands of the intestinal canal when they are secreting too much, and of contracting vessels already too much relaxed, without exerting any such power over the glands and vessels when they are acting naturally. It has been administered as an astringent in *leucorrhœa* and *sanguineous exhalations*, and as a tonic in *intermittents*. As a topical astringent it has been applied to fleshy ulcers, and used as a gargle, injection, and wash.

ADMINISTRATION.—The dose of the powder is grs. x. to ℈ss.

1. *TINCTURA KINO*, L. E. D. (Kino, bruised, ℥iiiss. [℥iij. *D.*]; Rectified Spirit, Oij. [Proof Spirit, Oij. *wine measure*, D.] Digest for seven days [fourteen, *L.*], and strain. "This tincture cannot be conveniently prepared by the process of percolation," *E.*)—Astringent. Used in diarrhœa and hemorrhages, generally as an adjunct to the chalk mixture. Dose, fℨj. to fℨij.—It is said, that by keeping, this tincture has in some instances become gelatinous, and lost its astringency. Where this occurred probably the *Botany Bay kino* (inspissated juice of the *Eucalyptus resinifera*) had been employed.

2. *PULVIS KINO COMPOSITUS*, L. D. (Kino, ℨxv.; Cinnamon, ℥ss.; Hard Opium, ℨj. Rub them separately to a very fine powder; then mix them). Twenty grains of this powder contain one grain of opium.—This powder is employed as an astringent in chronic diarrhœa, pyrosis, &c. The dose of it is grs. v. to ℈j.

SUB-ORDER II.—*MIMOSEÆ.*

Aca'cia, Decandolle.—*Various Species yielding Gum*, E.

Aca'cia ve'ra, *L.*—Aca'cia arab'ica et A. ve'ra, *D.*

Sex. Syst. Polygamia, Monœcia.

(Gummi, *L. D.*—Gum, *E.*)

HISTORY.—The Shittah tree (*Isaiah*, xli. 19), whose wood is mentioned in several parts of the Old Testament (as *Exod.* xxv. 5) is supposed to be an *Acacia*. By some it has been thought to have been the *A. vera* (Carpenter, *Script. Nat. Hist.*), by others, the *A. horrida* (*Picture Bible*).

Hippocrates speaks of the *Acacia* (Ἄκανθα or *Thorn*, p. 568, ed. Fœs.) which he sometimes calls the *Egyptian Acacia* (Ἄ. αἰγυπτία, p. 671), at other times, the *White Acacia* (Ἄ. λευκὴ, p. 632). He is usually supposed to refer to *Acacia vera*; but Dierbach (*Arzneim. d. Hippok.*) is of opinion that *A. Senegal* is meant; which, he observes, is distinguished by its white bark, white wood, and white flowers, and therefore the term *white* could apply to it only. Furthermore the *white fragrant ointment* (μύρον λευκὸν αἰγύπτιον, p. 265) was probably prepared from the flowers of the *A. Senegal*, and not of *A. vera*, whose flowers would yield a yellow ointment, and have not such an agreeable odour as those of the former species. Hippocrates (pp. 667 and 686) also mentions *gum* (κόμμι), which he used in medicine. Delile (*Flore d'Egypte*, p. 286, fol.) considers the Ἄκανθα διψὰς (*Thirsty Thorn*) of Theophrastus (*Hist. Plant.* lib. iv. cap. 8) to be *Acacia Seyal*, which Pliny (*Hist. Nat.* lib. xiii. cap. 1, ed. Valp.) calls *Spina sitiens*.

BOTANY. *Gen. Char.*—*Flowers* polygamous. *Calyx* four to five-toothed. *Petals* four to five, either free or cohering to form a four to five-cleft corolla. *Stamens* varying in number, ten to two hundred. *Legume* continuous, juiceless, two-valved.—*Shrubs* or *trees*. *Thorns* stipular, scattered, or none. *Flowers* yellow, white, or rarely red, capitate or spiked (D. C.)

Fig. 211.

Acacia vera.

Species. 1. A. vera, Willdenow, L. D. *Mimosa nilotica.* Linn. *Egyptian Thorn.*—*Spines* in pairs. *Branches* and *leaves* smooth. *Pinnæ* two pairs; *leaflets* eight to ten pairs, oblong-linear; with a gland between the pinnæ. *Flowers* in globose heads; heads about two together, stalked, axillary. *Legume* moniliform, (D. C.)—Middling-sized *tree.* *Flower-heads* bright yellow.—A native of Arabia, and of Africa from Senegal to Egypt. Its fruit, termed *Egyptian and Senegal bablah* (*bablah d'Egypte et du Sénégal*, Guibourt), has been employed in tanning and dyeing. The *succus acaciæ veræ* is the inspissated juice of the unripe fruit, and was formerly used as an astringent. Acacia vera yields *gum Arabic* and also a portion of the *gum Senegal.*

2. A. arabica, Willd. D. *Acacia nilotica*, Delile. *Mimosa arabica*, Roxburgh.—*Spines* in pairs. *Branches* and *petioles* pubescent. *Pinnæ* four to six pairs; *leaflets* ten to twenty pairs, oblong-linear, with a gland beneath the inferior and often between the last pinnæ. *Flowers* in globose, stalked, axillary, subternate heads. *Legume* moniliform (D. C.)—A small *tree.* *Flower-heads* yellow.—Considered by Ehrenberg to be a variety of the preceding species.—A native of Senegal, Egypt, Arabia, and India.—Its fruit, termed *Indian bablah* (*bablah de l'Inde*, Guibourt), is used for tanning and dyeing. Probably yields part of the *gum Arabic* and *East Indian gum.*

Fig. 212.

A. arabica.

3. A. Karoo, Hayne, Nees and Ebermaier.—Cape of Good Hope.—Said to yield *Cape gum.*

4. A. gummifera, Willdenow.—Arabia, Africa near Mogadore. Said by Forskäl (*Fl. Ægypt. Arab.* cxxiv.) to yield a gum, which is collected by the Arabs. Probably furnishes, in part at least, *Barbary gum.*

5. A. Seyal, Delile. Egypt and Senegambia. Yields a gum which forms part of *gum Senegal.* The tears are white, hard, vitreous, and vermiform.

6. A. tortilis, Forskäl, Nees, and Ebermaier.—Arabia. Its gum is collected by the Bedouins of the desert.

7. A. Ehrenbergii, Hayne, Nees, and Ebermaier.—Arabia. Its gum is collected by the Bedouins of the desert.

8. A. Senegal, Willdenow; *A. Verek*, Adanson.—Arabia and Africa, from Senegal to the Cape of Good Hope. Abundant in the forest of Sahel near Senegal. Yields *gum Senegal* in vermiform, ovoidal, or spheroidal tears, which are wrinkled externally, but are transparent internally.

Production of Gum.—The gum of the Acacia trees flows, in the liquid state, from the trunk and branches, and hardens by exposure to the air. It usually exudes spontaneously (See some remarks on the cause of the exudation of gum, p. 1139). In some instances, however, the discharge is facilitated by incisions. In Barbary the largest quantity of gum is procured during the hot and parching months of July and August. "The more sickly the tree appears, the more gum it yields; and the hotter the weather, the more prolific it is. A wet winter and a cool or mild summer are unfavourable to the production of gum" (Jackson, *Account of the Empire of Marocco*, p. 137, 3rd ed.) In Senegal the gum begins to flow when the tree first opens its flowers (Adanson, *Mem. de l'Ac. d. Sc. d. Paris*, 1773, p. 8); and it continues during the rainy season till the month of December, when it is collected for the first time. Another collection of the gum is made in the month of March, from incisions in the bark, which the extreme dryness of the air at that time is said to render necessary (Demanet, *Nouv. Hist. de l'Afrique Françoise*, t. i. p. 56, quoted by Woodville, *Med. Bot.* vol. ii. p. 188).

Commerce.—Acacia gum is the produce of Africa principally, and of Asia. It is imported from the Levant and other parts of the Mediterranean, from Barbary, Senegal, the East Indies, the Cape, &c. It comes over in chests, casks, skins, serons, bags, &c. The duty on it is 6s. per cwt. The following are the quantities on which duty was paid in 1839 (*Trade List*):—

Gum from the East Indies	7,869 cwts.
Senegal Gum	24,698
Other sorts of Gum	7,759
Total	40,326 cwts.

Description.—Acacia gum (*gummi acaciæ*) occurs in variable-sized tears, which are inodorous, more or less coloured, have a slightly sweetish taste, and a greater or less degree of transparency. Ehrenberg asserts that the characters of gum of the same species of plant are liable to considerable variation. Thus the same tree may yield a transparent or an opaque,—a light or a dark-coloured, gum. The following are the most important varieties of Acacia gum:—

1. *Turkey* or *Arabic Gum* (*Gummi turcicum* seu *arabicum; Gummi Mimosæ verum*, Martius; *Gomme arabique vraie*, Guibourt). This is imported from Leghorn, Malta, Trieste, Gibraltar, Smyrna, Alexandria, Beyrout, Constantinople, &c. It is the produce of *Acacia vera*, and probably of other species, especially *A. arabica*. It occurs in rounded tears, or amorphous or angular pieces, varying in size from a pea to that of a walnut, or even larger than this; some of the pieces being transparent, others more or less opaque, from innumerable cracks extending through them. It has a glassy lustre, is white, yellow, or wine-yellow, and has no odour, or if any, an acid one. Its specific gravity varies from 1·316 to 1·482. It may be readily broken into small fragments. It is entirely

soluble in water, the solution having the property of reddening litmus, and being feebly opalescent. The latter property is said, by Guerin, to be owing to a small quantity of insoluble nitrogenous matter present. The white pieces constitute the *gummi electum* of our druggists. On the continent they are called *gum Turic* (*gomme Turique*), from *Tor*, the name of a seaport of Arabia, near the isthmus of Suez; while the red pieces are sometimes said to constitute the *gum Gedda* (*gomme Jedda*, or *Gedda*), so called after another port. Gum Gedda is occasionally imported into this country unmixed with other kinds of gum. In all the entries of it which I have been able to trace, it came from Alexandria in barrels.

2. *Barbary* or *Morocco Gum* (*Gummi Barbaricum*). This is imported from Mogadore and Mazagan. In 1830, there were imported from Tripoli, Barbary, and Morocco, 2063 cwts. of gum (*Parl. Return*). Barbary gum is probably the produce of *Acacia gummifera*. Jackson says, it is obtained from a high thorny tree, called *Attaleh*. The best kind is procured from the trees of Morocco, Ras-el-wed, in the province of Suse, and Bled-hummer, in the province of Abda;—the second qualities are the produce of Shedma, Duguella, and other provinces. I have two varieties of Barbary gum: one (the *Gomme de Barbarie* of Guibourt) is in roundish or irregular tears, mixed with many impurities, imperfectly transparent, and of a dull yellowish colour, with a faint tint of green.—It is imperfectly soluble in water, and has some analogy to Senegal gum. The other kind (called *Mogadore gum*) is in small angular broken, mostly yellow, pieces, which resemble fragments of Turkey gum.

3. *Gum Senegal* (*Gummi Senegalense*).—This gum is imported from St. Louis, St. Mary's, the river Gambia, Senegal, and Bathurst. In 1839, duty (6s. per cwt.) was paid on 24,698 cwts. Gum Senegal is probably obtained from several species of *Acacia;* but especially *A. Senegal. A. vera*, *A. Seyal*, and *A. Adansonii*, are also said to produce it in part. It occurs in larger tears than those of Turkey or Arabic gum. On breaking them we frequently find large air-cavities in their centres. Occasionally we meet with whitish pieces, but for the most part they are yellow, reddish-yellow, or brownish-red. More difficulty is experienced in breaking or pulverizing this gum than gum Arabic, and its fracture is more conchoidal. The taste of this gum is similar to that of the last.

Guibourt distinguishes two varieties of this gum, one of which he terms *Gomme du Bas du Fleuve*, or *gum Senegal, properly so called;* the other the *Gomme du Haut du Fleuve*, or *Gomme de Galam*. The first is probably the produce of *Acacia Senegal*, while the second is procured from *A. vera*. There is but little difference between them: yet gum Galam has a greater resemblance to Turkey gum than Senegal gum has; the pieces are more broken, and therefore more brilliant than those of gum Senegal, properly so called.

Those pieces of gum which have on some part of them a yellowish opaque skin or pellicle, constitute the *Gomme pelliculée* of Guibourt. The *Marrons de Gomme*, or *Gomme lignirode*, of the same pharmacologist, is also found in the Senegal gum of commerce: it consists of yellowish, or dark-brownish pieces, which are difficult to break, opaque and rough. Treated with water it partially dissolves, leaving, says Guibourt, a residue of gnawed wood (*bois rongé*). Guibourt states, that in most of the *marrons* he has found a large ovoid cell, which had been the habitation of the larvæ of some insect; from whence he concludes that this substance is the work of an insect.

4. *East India Gum* (*Gummi indicum* seu *ostindicum*).—This variety is imported principally from Bombay. In 1839, duty (6s. per cwt.) was paid on 7,869 cwts. It is probably the produce of various species. Many pieces agree in their physical and chemical characters with Turkey and Arabic gum, and are probably the produce of *Acacia arabica*, or some allied species (*yellow E. I. gum*). Others, however, are larger, red or brown, and more difficult to pulverize than Turkey or Arabic gum (*brown E. I. gum*). Are these the produce of *Feronia Elephantum?*

I have received from Bombay three varieties of gum: one, marked *Maculla best gum Arabic*, very similar to gum Galam; a second, marked *Mocha and Barbary gum*, in large, reddish-coloured, rough tears; and a third, denominated *Surat inferior gum Arabic*, in smaller dark-coloured tears.

5. *Cape Gum* (*Gummi Capense*).—This is imported from the Cape of Good Hope. In 1829 there was exported from the Cape 16,943 lbs. and two cases of gum (McCulloch, *Dict. of Comm.*) In 1830 the quantity imported into the United Kingdom was only 1 cwt. 3 qrs. 14 lbs. (*Parl. Ret.*); but since then the importation has greatly increased. Mr. Burchell (*Travels in the Inter. of South Africa*, 1822-4) says, Cape gum is obtained from a species of *Acacia* (which he has figured in vol. i. pp. 189 and 325), closely resembling *A. vera*, and which he calls *A. capensis* (*A. Karoo*, Hayne?). It is most abundant on the banks of the Gariep, and between the Cape and the Gariep. Notwithstanding that he asserts the quality of Cape gum as in no way inferior to that of *A. vera*, it is considered by our dealers as a very inferior kind.

Besides the preceding gums, there are several others described by continental pharmacologists, but which are unknown in English commerce. Such are the following:—

(*a.*) *Gum Bassora. Gummi Toridonnense.*—This gum occurs in variable sized pieces, which are whitish or yellowish, and opaque. When put into water it swells up, but dissolves only in part. The insoluble portion has been called *bassorin*. Its origin is unknown. Virey thinks that it is produced by a *Mesembryanthemum;* Desvaux and Damart by a *Cactus*.

(*b.*) *Gum Kuteera.*—Considered by Guibourt as identical with the preceding; but the sample given me by Professor Royle is very distinct. It has considerable resemblance to the flaky tragacanth (p. 1139), for which it has been attempted to be substituted (*Nicholson's Journal*, vii. 301). It is, probably, the produce of *Sterculia urens*, a plant belonging to the family *Byttneriaceæ* (Roxburgh, *Fl. Indica*, iii. 146).

(*c.*) Under the name of *Hog gum* I have met with, in commerce, an unsaleable gum, which greatly resembles a sample sent me by Professor Guibourt, as *gomme pseudo-adraganthe*, or *gomme de Sassa* (see his *Hist. des Drog.* ii. 477, 3me éd.) It is in reddish-yellow, somewhat transparent masses, many of which are twisted like a snail or ammonites. The *Rhus Metopium* yields a substance called *Hog gum* (see Brown's *Nat. Hist. of Jamaica*, p. 177), but I know not whether it be identical with the gum above referred to.

Adulteration.—The inferior and cheaper kinds of gum (as the Barbary, East Indian, and Senegal gums) are not unfrequently substituted for the Turkey or Arabic gum, especially in the form of powder. Flour (or starch) is sometimes mixed with powdered gum: the adulteration is readily recognized by the blue colour produced on the addition of a solution of iodine to the cold mucilage of suspected gum.

Composition.—Several *ultimate* analyses of gum have been made. The most important are those of Berzelius (*Ann. de Chim.* xcv. 77), Prout (*Phil. Trans.* for 1827), Guerin (*Journ. de Chim. Méd.* vii. 742), and Mulder (*Pharm. Central-Blatt für* 1839, S. 137).

	Gum Arabic.			*Gum Senegal.*		*Soluble pt. of Gum Bassora.*
	BERZELIUS	PROUT	MULDER	GUERIN	MULDER	GUERIN
Carbon	41·906	41·4	45·10	43·59	44·92	43·46
Hydrogen........	6·788	6·5	6·10	6·23	6·09	6·26
Oxygen	51·306	52·1	48·80	50·07	48·99	50·28
Nitrogen	a trace	0·0	0·0	0·11	0·0	0·0
Total........	100·000	100·0	100·00	100·00	100·00	100·00

The formula $C^{13} H^{12} O^{12}$ agrees with the analyses of Berzelius and Prout. Mulder gives, as the formula for gum Arabic, $C^{12} H^{10} O^{10}$. According to the first formula the atomic weight will be = 186; according to the second, = 162.

The *proximate* analysis of gum has been made by Guerin (*op. supra cit.*)

	Gum Arabic.	*Gum Senegal.*	*Gum Bassora.*
Soluble gum (*Arabin*)......	79·40	81·10	11·20
Insoluble gum (*Bassorin*)	0·00	0·00	61·31
Water	17·60	16·10	21·89
Ashes	3·00	2·80	5·60
Total.......	100·00	100·00	100·00

1. *Soluble Gum* or *Arabin.*—Is a colourless, inodorous, insipid, uncrystallizable solid, soluble in both hot and cold water, but insoluble in alcohol, ether, and oils. It combines with alkalies. Sulphuric acid converts it into a saccharine substance. 100 parts of arabin treated with 400 parts of nitric acid, yielded Guerin 16·88 of mucic acid, with a little oxalic acid. From *cerasin*, or *prunin* (p. 1127), it is distinguished by its solubility in cold water. The characters by which it is distinguished from *tragacanthin* (p. 1140), *carrageenin* (p. 564), and *cydonin* (p. 1127) have been already pointed out. According to Guerin, arabin consists of *carbon* 43·81, *hydrogen* 6·20, *oxygen* 49·85, ad *nitrogen* 0·14.

2. *Insoluble Gum* or *Bassorin.*—Is distinguished by its insolubility in water, both hot and cold. It absorbs in water, and swells up. It is insoluble in alcohol. 100 parts treated by 1000 of nitric acid, furnished 22·61 of mucic acid, with a little oxalic acid. It consists, according to Guerin, of *carbon* 37·28, *hydrogen* 55·87, and *oxygen* 6·85.

c. Salts.—The *ashes* of gums Arabic and Senegal consist of carbonates of potash and lime, with minute portions of chloride of potassium, oxide of iron, alumina, silica, and magnesia. The carbonate of lime is formed by the decomposition of the malate of lime contained in the gum, while the carbonate of potash results from the decomposition of acetate of potash.

Chemical Characteristics.—*Gum Arabic* is soluble in both hot and cold water, forming mucilage. Alcohol precipitates the gum from its solution. Diacetate of lead causes a white precipitate (*gummate of lead*) with the solution. A solution of silicate of potash (prepared by fusing three parts of carbonate of potash with one part of silver sand) causes a white flaky precipitate. Oxalate of ammonia a white precipitate (*oxalate of lime*). When a concentrated solution of sesquichloride of iron is dropped into strong mucilage, the whole becomes, after some hours, a brown semitransparent jelly. Nitrate of mercury produces a precipitate with a solution of gum.

Physiological Effects. (*a.*) *On animals generally.*—The effects of injecting solutions of gum into the veins of animals (horses and dogs) have been examined by Viborg, Scheele, and Hertwich (Wibmer, *Wirk. d. Arzneim. ü. Gifte.* Bd. i. S. 3). From their experiments it appears that small quantities only can be thrown into the circulation with impunity. From half a drachm to one or two drachms of gum, dissolved in one or two ounces of water, disorder the respiration and circulation of horses; while five or six drachms of gum give rise to an affection of the nervous system, manifested by stupor and paralysis, or convulsions. Some of these effects (namely those on the pulmonary and vascular system) may arise from the non-miscibility of mucilage with the blood, and its consequent mechanical influence in obstructing the capillary circulation of the lungs. Magendie (*Ann. de Chim. et Phys.* t. iii. p. 66) has shown that dogs fed on gum alone languish and die in two or three weeks; and Tiedemann and Gmelin (Müller's *Phys.*, by Baly, i. 482) found that a goose fed with gum died on the sixteenth day. These, with other experiments, show that animals require more than one kind of aliment to preserve them in health.

(*b.*) *On Man.*—Regnandot (Wibmer, *op. supra cit.* S. 6) injected three drachms of gum, dissolved in three ounces of water, into the veins of a man aged twenty years. In half an hour the patient was very chilly, his pulse was small and quick, and he had three liquid stools. The chilliness was succeeded by great heat, and after fifteen hours an eruption appeared on the skin.

The nutritive property of gum, when taken into the stomach, is shown by a variety of facts. In the first place, it constitutes a considerable portion of several well-known articles of food. Secondly, it sometimes forms the principal or only food of man. Hasselquist (*Voyages and Travels in the Levant*, p. 298, 1766) tells us, that a caravan of more than a thousand persons, travelling from Abyssinia to Cairo, and whose provisions were exhausted, supported themselves for two months on the gum they were carrying as merchandize. Moreover, we are told that the Moors and Negroes live almost exclusively on it during the gum harvest; and the Bushmen Hottentots, in times of scarcity, support themselves on it for days together. Six ounces a day are said to be sufficient to sustain life in a healthy adult. But though gum be nutritive, it is difficult of digestion; and hence mucilaginous foods are apt to disagree with dyspeptics.

The local action of a solution of gum is that of an emollient, and (by its sheathing properties) demulcent. It is not known to possess any action over remote parts, though some have supposed it to have the power of diminishing irritation in the urinary organs.

Uses.—Gum is employed in medicine as an emollient and demulcent, but more frequently as a vehicle for the exhibition of other medicines. It is sometimes slowly dissolved in the mouth, to allay troublesome cough, and to diminish irritation of the fauces, by diluting the acrid secretions, and sheathing the parts from the action of the atmosphere. In inflammatory affections of the intestinal tube, as well as of the respiratory and urinary organs, gum is used as an emollient and demulcent. As a sheathing substance, a solution of gum may be employed in acrid poisoning; but of course its efficacy is mechanical merely. Powdered gum is occasionally applied to check hemorrhage from leech bites.

As a vehicle for the exhibition of other medicines, it is employed in the form either of powder or mucilage. The former is used to give bulk to active and heavy powders; as calomel, emetic tartar, &c., and in the preparation of lozenges. The latter is employed to suspend insoluble powders (as oxide of zinc, musk, &c.) in water, or to diffuse oily and resinous substances through aqueous fluids, and to give form and tenacity to pills. Furthermore, the adhesive qualities of mucilage renders it exceedingly useful for various other pharmaceutical purposes.

ADMINISTRATION.—The dose of powdered gum is from ʒss. to ʒj., or *ad libitum*.

1. *MISTURA ACACIÆ*, L. *Mucilago*, E. *Mucilago Gummi Arabici*, D. (Acacia powdered, ℥x.; Boiling Water, Oj. Rub the Acacia with the water gradually poured in, and dissolve it, L.—The *Edinburgh College* uses only ℥ix. of Gum to Oj. of Cold Water, and directs the gum to be dissolved without heat, but with occasional stirring, and the solution to be strained through linen or calico.—The *Dublin College* employs ℥iv. of coarsely-powdered Gum to f℥iv. of Hot Water, and directs the mucilage to be strained through linen).—The process of the Edinburgh College is to be preferred, as being sufficiently strong, and made without heat, (which causes gum to become somewhat acid, and thereby renders it somewhat acrid). The Dublin process yields a mucilage too thick to be strained. By keeping, mucilage readily becomes sour by the development of acetic acid. The pharmaceutical uses of mucilage have been above referred to. To render different substances miscible with aqueous vehicles, different proportions of mucilage are required. "*Oils* will require about three-fourths of their weight, *balsams* and *spermaceti* equal parts, *resins* two parts, and *musk* five times its weight" (Montgomery, *Observ. on the Dubl. Pharm.*)

2. *MISTURA ACACIÆ*, E. (Mucilage, f℥iij.; Sweet Amonds, ℥j. and ʒij.; Pure Sugar, ʒv.; Water, Oij. Steep the almonds in hot water, and peel them; beat them to a smooth pulp in an earthenware or marble mortar, first with the sugar, and then with the mucilage; add the water gradually, stirring constantly; then strain through linen or calico).—Demulcent and emollient. Applicable to the same purposes as *Mistura Amygdalæ* (see p. 1109). Dose, f℥j. to f℥ij.

3. *TROCHISCI ACACIÆ*, E. *Gum Lozenges*. (Gum Arabic, ℥iv.; Starch, ℥j.; Pure Sugar, lbj. Mix and pulverize them, and make them into a proper mass with rose-water for forming lozenges). An agreeable pectoral. Employed to allay the tickling in the throat, which provokes coughing.

Aca'cia Cat'echu, Willdenow, L. E. D.—*The Catechu Acacia*.

Mimo'sa Cat'echu, *Linn.*

Sex. Syst. Polygamia, Monœcia.

(Ligni extractum, *L.*—Extract of the Wood, *E.*—Extractum ex ligno, *D.*)

HISTORY.—It is somewhat uncertain who first described Catechu. Garcias ab Orto (*Clusii Exot.* lib. i. cap. x. p. 163) was of opinion that it was the Λύκιον Ινδικὸν of Dioscorides (lib. i. cap. 132): but Dr. Royle (*Linn. Trans.* vol. xvii. p. 83), in a very elaborate and learned paper on this subject, has apparently proved that the preparation referred to by the latter author is the produce of *Berberis Lycium*, Royle.

BOTANY. *GEN. CHAR.*—See ACACIA (p. 1146).

SP. CHAR.—Arboreous. *Branches* armed with stipulary thorns, or occasionally unarmed. *Young shoots*, *petioles*, and *peduncles* more or less pubescent. *Leaves* bipinnated; *pinnæ* ten to thirty pairs; *leaflets* thirty to fifty pairs; *petiole* sometimes armed on the under side with a row of prickles, with one large gland below the lowest pair of pinnæ, and between the extreme one to six pairs. *Spikes* axillary, one to four together, shorter than the leaves. *Flowers* numerous. *Petals* united. *Stamens* distinct, numerous. *Legumes* flat, thin, straight, linear, glabrous, four to eight-seeded (Wight and Arnott).

Tree from fifteen to twenty feet high. *Bark* brown and scabrous. *Wood* hard and heavy; the interior (*duramen*) brown, dark-red, or blackish; the exterior (*alburnum*) white, one or two inches thick. *Flowers* whitish or pale yellow.

Hab.—Various parts of the East Indies; now common in Jamaica.

Manufacture of Catechu.—The manufacture of Catechu from the *Acacia Catechu*, as practised in Canara and Behar, has been described by Mr. Kerr (*Med. Observ. and Inq.* vol. v. p. 151) and Dr. F. Buchanan Hamilton (*Journ. from Madras through Mysore, Canara, and Malabar*, vol. iii. p. 177, 1807), while Dr. Royle (*Illustr.* p. 182) has explained the process followed in Northern India. According to the last-mentioned gentleman, "the *Kutt* manufacturers move to different parts of the country in different seasons, erect temporary huts in the jungles, and selecting trees fit for their purpose, cut the inner wood into small chips. These they put into small earthen pots, which are arranged in a double row along a fire-place built of mud (*choola*); water is then poured in until the whole are covered; after a considerable portion has boiled away, the clear liquor is strained into one of the neighbouring pots, and a fresh supply of material is put into the first, and the operation repeated until the extract in the general receiver is of sufficient consistence to be poured into clay moulds, which, in the Kheree Pass and Doon, where I have seen the process, are generally of a quadrangular form. This Catechu is usually of a pale-red colour, and is considered there to be of the best quality. By the manufacturers it is conveyed to Saharunpore and Moradabad, whence it follows the course of commerce down the Ganges, and meets that from Nepal, so that both may be exported from Calcutta."

Description.—The term *Catechu* (from *cate* a tree, and *chu* juice) is applied to several astringent extracts imported from India and the neighbouring countries. In the *Edinburgh Pharmacopœia* catechu is said to be the "extract of the wood of *Acacia Catechu*, of the kernels of *Areca Catechu*, and of the leaves of *Uncaria Gambier*, probably too from other plants." A few years ago the terms *Catechu*, *Terra japonica*, and *Cutch*, were employed synonymously; they are now, however, for the most part, used in trade somewhat distinctively, though not uniformly in the same sense. Two kinds only are largely imported into this country; one of these (*Gambier; Terra japonica* of tanners; *Pale Terra japonica* of the Trade List; the *Catechu in square cakes* of Druggists; *Catechu* of *Uncaria Gambier*, Ph. Ed.) has been already described (see p. 1025): the other kind, termed *Pegu Catechu* or *P. Cutch*, is, as well as *Colombo Catechu* or *Colombo Cutch*, denominated *Black Terra japonica* in the Trade List. I have not hitherto been enabled to identify the catechu of *Areca Catechu* before referred to (see p. 615).

In 1839, the total quantity of Catechu or Terra japonica (of all sorts) on which duty (1s. per cwt.) was paid, was, according to the *Trade List* (Jan. 7th, 1840) 48,318 cwts.

Pegu Catechu or *Pegu Cutch*; *Cutch.* (*Cachou en masse; Cachou lucide; Cachou du Butea frondosa*, Guibourt).—This variety is imported from Pegu. According to Herbert de Jæger (*Miscellanea curiosa*, Dec. ii. Ann. iii. p. 9) the catechu of Pegu is obtained from the Acacia Catechu; and, he adds, it is celebrated throughout India. It is imported in large masses weighing sometimes a *cwt.* each. These masses are made up of layers composed of prismatic pieces, each from six to ten inches long, and two or three inches broad and deep. Each piece is enveloped in the leaves of *Nauclea Brunonis*, a native of Tavoy, Wallich, *Cat.* (not of *Butea frondosa*, as formerly supposed). When fractured, these pieces present a dark blackish-brown shiny surface, free from all impurities; some of the pieces, however, having a more reddish tint than the others. Their taste is bitter and astringent. Fée states, though I know not on what authority, that this variety contains 57 per cent. of tannic acid. Pegu catechu is largely employed, I am informed, for dyeing. The greater part of that brought to this country is exported for continental use.

I have a similar kind of catechu in round balls (*Pegu cutch in balls?*) enveloped in leaves of (apparently) Nauclea Brunonis.

Brown Catechu in conical masses from Siam.—This variety has been recently imported from Siam in bags. It is in masses shaped like a betel-nut, or rather that of a mullar or truncated olive, each weighing about a pound and a half. The flattened base is marked with the impression of the leaf of *Nauclea Brunonis.* Internally this catechu is shiny and liver-coloured, strongly resembling hepatic aloes. In its other qualities it agrees with Pegu Catechu.

The following kinds of catechu are of less frequent, some of them of rare, occurrence in commerce.

1. *Dark-brown Catechu in circular flat cakes; Colombo* or *Ceylon Catechu* or *Cutch* (*Cachou brun, orbiculaire et plat.* Guibourt). Imported from Ceylon. Cakes round, flat, covered on one side with paddy husks (glumes of rice), from two to three inches in diameter, scarcely one inch thick, and weighing from two to three ounces. Internally they are dark, blackish-brown, and shiny, exactly resembling Pegu Catechu. Common. Quality excellent.—A cooled decoction of this catechu produces a blue colour with a solution of iodine.

Under the name of *Cutch* I have received a catechu in flat cakes like the preceding, but unmixed with rice glumes. The cakes have a rusty appearance externally.

2. *Dark brown Catechu in round balls.*—Balls more or less flattened, not exceeding the size of a small orange, and covered with paddy husks (glumes of rice). In other respects identical with the preceding. It agrees with the kind referred to by Dr. B. Hamilton.

3. *Black mucilaginous Catechu.* (*Cachou noir et mucilagineux*, Guibourt).—In parallelopipeds of eighteen lines on the side, and an inch high. Internally black and shiny, somewhat similar to extract of liquorice. Quality bad.

4. *Dark-brown siliceous Catechu, in flattened, circular, or quadrangular cakes.* (*Cachou brun siliceux*, Guibourt).—Formerly called by druggists *Terra japonica.* Perhaps the *Bombay Catechu* of Sir H. Davy. It is in round or flattened masses, varying in weight from two or three ounces to several pounds; externally it is of a dull dark-brown or rusty colour, internally being shiny and blackish-brown. It is very heavy, and contains a large quantity of fine sand. Guibourt says, 100 parts of this catechu yielded him 26 parts of earthy matter. But some of the specimens contain a much less portion of earthy matter. Quality bad.

5. *Dull reddish Catechu in balls.* (*Cachou en boules, terne et rougeâtre*, Guibourt).—In the collection of the Medico-Botanical Society of London, marked *American Catechu.* Balls flattened, weighing three or four ounces, covered on one side with glumes of rice. Its fracture is dull, reddish, wavy, and often marbled. Quality good.

6. *Pale Catechu.* Of this I have met with two kinds:—

a. Pale Catechu in broken square cakes; Bengal Catechu of Sir H. Davy? (*Cachou terne et parallélipipède*, Guibourt; *Cachou en manière d'écorce d'arbre*, A. Jussieu)—I find this to be identical with Dr. Royle's specimens of catechu, which he saw prepared in India from the *Acacia Catechu.* It occurs in square cakes, usually about two inches long, two inches broad, and one in thickness. Frequently these cakes are irregularly broken, so that it is difficult to trace their angular character. They are heavier than water. Externally their colour is dark-brown, or blackish; internally we observe darker and lighter layers, disposed in a schistose manner, like the bark of a tree. The darker layers are brown and somewhat shiny, the lighter ones are dull reddish-white. A decoction of one part of this catechu and twelve parts of water lets fall, on cooling, a copious whitish precipitate (*catechuic acid*).

b. Pale or *Whitish Catechu in irregular lumps.* (*Cachou blanc*, Guibourt)—I received this from Bombay, under the name of *Katha suffaid* (i. e. *pale* or *white catechu*). It is in lumps, which vary in size from that of a walnut to that of a small apple. The general form is rounded or oval, and somewhat flattened, the surface being very uneven, and of a dark or blackish-brown colour. Internally this variety is dull, and of a very pale colour. Guibourt says, it is almost white; but it has a pale-yellowish or brownish-red tint. Its taste is bitter, astringent, and sweetish, with a smoky flavour. Hence, perhaps, the dark colour externally is derived from the masses being dried, or exposed to the smoke of a fire.

Composition.—Two kinds of Catechu were analyzed by Sir H. Davy (*Phil. Trans.* for 1803, p. 233). In 1833, Buchner discovered in catechu a peculiar acid, which has been denominated *Catechuic acid* (*Pharm. Central. Blatt. für* 1833, 629).

Davy's Analyses.

	Bombay.	*Bengal.*
Tannin	54·5	48·5
Peculiar extractive	34·0	36 5
Mucilage	6·5	8·0
Insoluble matter (chiefly sand and lime)	5·0	7·0
Catechu	100·0	100·0

1. *Catechuic Acid.*—This has been already noticed (see p. 1027-8).

2. *Tannic Acid.* The general properties of this acid have also been before described (see p. 735)—It is this substance which renders catechu so valuable to the tanner. The peculiarities of the tannic acid of catechu have been studied by Berzelius (*Traité de Chim.* t. v. 588), but in consequence of the subsequent discovery of catechuic acid they require re-examination. The tannic acid of catechu is easily soluble in water and alcohol, but very slightly so in ether. The aqueous solution becomes coloured by exposure to the air. Its combinations with acids are very soluble. Alkalies do not precipitate it.

Chemical Characteristics.—The brown, filtered, decoction of catechu reddens litmus, yields a blackish-green colour and precipitate (*catechuate and tannate of iron*) with the ferruginous salts, and a brownish-white one with acetate of lead. A solution of gelatine renders the cooled decoction turbid (*tannate of gelatine*). Alkalies deepen the colour of the decoction, but cause no precipitate. Sulphuric acid renders the decoction slightly turbid.

The filtered decoction of several kinds of catechu (especially *pale catechu in broken square cakes*) deposits, on cooling, catechuic acid.

The decoction of *dark-brown catechu, in circular flat cakes*, when cold becomes blue (*iodide of starch*) on the addition of a solution of iodine.

Purity.—The Edinburgh College states, that "the finest qualities [of catechu] yield to sulphuric ether 53, and the lowest qualities 28 per cent. of tannin dried at 280°." This proceeding, however, is not to be relied on as a test of the astringency of catechu, which can only be determined in the usual way by gelatine. The College errs in supposing that the etherial extract is necessarily either wholly or in great part tannin; for catechuic acid, which constitutes a large portion of some kinds of catechu, is soluble in ether.

Physiological Effects.—Catechu produces the local and general effects of the astringents before described (see p. 79). When of good quality it is more powerful than kino. In its operation it is closely allied to rhatany root (*Krameria triandra*).

Uses.—Employed as an astringent in the following cases:—

1. *In affections of the mouth and throat.*—In various affections of the mouth and throat I have frequently employed catechu, and found it a convenient and efficacious astringent. Thus, in relaxed uvula, and in that slight chronic inflammatory affection of the throat usually denominated the relaxed sore throat, and which is especially observed in delicate females, catechu, chewed or sucked, is a most useful remedy. The purer kinds of catechu should be selected, especially avoiding those that are gritty. Or catechu lozenges may be employed. The pale kinds of catechu (as *gambir*, described at p. 1026), are usually sweeter and more agreeable than the dark varieties. For public speakers or singers also it is a useful remedy; it prevents or diminishes hoarseness consequent on frequent use of the vocal organs. In slight ulcerations of the mouth also it is useful.

2. *As a stomachic in dyspeptic complaints.*—I have known catechu chewed with advantage in dyspeptic complaints. It should be used just before taking food: it promotes the appetite, and assists digestion.

3. *As an alvine astringent* it may be employed in old-standing diarrhœas and dysenteries, when there are no inflammatory symptoms present. It is often conjoined with the chalk mixture, and not unusually with opiates.

4. *As an astringent in hemorrhages* of an atonic character. A scruple of catechu, with grs. xij. of confection of opium, and a sufficient quantity of aromatic confection to make a bolus, was a favourite prescription of Dr. Babington, sen. in immoderate flow of the menses (Ainslie, *Mat. Ind.* i. 590).

5. *In lead colic* it was recommended by Grashius (*De Colica Pictonum*, Amsterd. 1752).

6. *In mucous discharges*, as gleets, fluor albus, chronic old-standing cystirrhœa, &c.

7. *As a topical application to ulcers.*—"An ointment composed of ℥iv. of catechu, ʒix. of alum, ℥iv. of white resin, and f℥x. of olive oil, with a sufficient quantity of water, is in great repute in India as an application to ulcers" (Thomson, *London Dispens.*)

Administration.—Dose, grs. x. to ʒj. It may be administered in the form of bolus, or of mixture with sugar and gum Arabic. For gradual solution in the mouth, I have found a lump of the purer kinds of commercial catechu more agreeable than *catechu lozenges*, which I requested a manufacturer of lozenges to prepare for me.

1. Infusum Catechu compositum, L. D. *Infusum Catechu*, E. (Catechu, powdered, ʒvj. [ʒiiss. *D.*]; Cinnamon, bruised, ʒj. [ʒss. *D.*]; [Syrup, f℥iij. *E.*]; Boiling [distilled, *L.*] Water, Oj. [f℥xvij. *E.* Oss. wine measure, *D.*] Macerate the Catechu and Cinnamon in the Water, in a lightly-covered vessel, for an hour [two hours, *E.*], then strain

[through linen or calico, and add the syrup, *E.*]—Astringent. Adapted to diarrhœa. Dose, f℥j. or f℥ij. three or four times a day. Frequently given in conjunction with opiates. Sometimes used in the form of enema.

2. *TINCTURA CATECHU*, L. E. D. (Catechu [in moderately fine powder, *E.*], ℥iiiss. [℥iij. *E. D.*]; Cinnamon, bruised [in fine powder, *E.*], ℥iiss. [℥ij. *E. D.*]; Proof Spirit, Oij. [Oj. and f℥xvj. *E.* Oij. wine measure, *D.*] Macerate for fourteen [seven, *E. D.*] days, and strain [and strongly express the residuum; filter the liquors, *E.*] "This tincture may be also prepared by the process of percolation, the mixed powders being put into the percolator without being previously moistened with the spirit," *E.*).—Astringent. Usually employed as an adjunct to chalk mixture in chronic diarrhœas and dysentery; or occasionally to Port wine, with some aromatic (nutmeg or cinnamon). Dose, fʒj. to fʒij.

3. *ELECTUARIUM CATECHU*, E. *Electuarium Catechu compositum*, D. (Catechu, ℥iv.; Kino, ℥iv. [℥iij. *D.*]; Cinnamon, ℥j. [℥ij. *D.*]; [Nutmeg, ℥j. *E.*]; Opium, diffused in a little Sherry, ʒiss.; Syrup of Red Roses [Syrup of Ginger, *D.*], boiled to the consistence of honey, Oiss. [lb. ij¼. *D.*] Pulverize the solids; mix the Opium and Syrup, then the powders, and beat them thoroughly into a uniform mass).—Astringent. Employed in chronic diarrhœa, dysentery, and hemorrhages. Dose, ℈j. to ʒij. One ounce of this electuary, prepared according to the Dublin pharmacopœia, contains two grs. and a half of opium.

Andi'ra iner'mis, Kunth.—*The Cabbage-Bark Tree.*

Geoffroy'a iner'mis, *Swartz, D.*

Sex. Syst. Diadelphia, Decandria.

(Cortex, *D.*)

HISTORY.—The medicinal properties of the bark of this tree were first pointed out by Mr. Duguid (*Edinb. Phys. and Lit. Essays*, vol. ii.) The first botanical description of the tree was published by Dr. Wright (*Phil. Trans.* vol. lxvii. pt. ii. p. 507).

BOTANY. *GEN. CHAR.*—*Calyx* turbinate-campanulate, five-toothed; teeth almost equal, acute, erect. *Corolla* papilionaceous; the vexillum roundish, emarginate, larger than the keel. *Stamens* diadelphous (nine and one). *Ovary* containing three ovules. *Legume* stalked, somewhat orbicular, rather hard, one-celled, one-seeded; when ripe divisible into two valves, according to Swartz (D. C.)

SP. CHAR.—*Leaflets* thirteen to fifteen, ovate-lanceolate, acute, smooth on both sides. *Flowers* paniculate, with very short pedicels. *Calyx* urceolate, ferruginous-pubescent (D. C.)

Tree of considerable height. *Leaves* pinnate. *Flowers* reddish-lilac.

HAB.—West Indies.

DESCRIPTION.—*Cabbage bark* or *Worm bark* (*cortex andiræ inermis*, seu *geoffroyæ jamaicensis*) occurs in long, thick, fibrous pieces, having a brownish-ash colour, a resinous fracture, a disagreeable smell, and a sweetish, mucilaginous, bitter taste.

Surinam bark (*cortex geoffroyæ Surinamensis*) is the bark of *Andira retusa*, var. β. *Surinamensis*, Decandolle. Huttenschmidt (*op. infra cit.*) found in it a white crystalline substance, which he called *Surinamin*. Surinam bark has been used as a vermifuge, but I am totally unacquainted with it (Göebel, *Pharm. Waarenk.* i. 201; Murray, *App. Med.* ii. 492).

Composition.—Cabbage-bark was analyzed in 1824 by Huttenschmidt (Gmelin, *Handb. d. Chem.* ii. 1264), who found in it the following substances:—*Jamaicina, yellow colouring matter, gum,* much *starch, wax, brown resin,* a small quantity of *mouldy matter,* a *nitrogenous substance* soluble in carbonate of soda, *oxalate of lime,* and *woody fibre.*—The *ashes* contained carbonate, phosphate, and sulphate of potash, chloride of potassium, carbonate and phosphate of lime, with magnesia, silica, and oxide of iron.

Jamaicina is a brownish-yellow crystalline, fusible, very bitter substance, composed of *carbon, hydrogen, nitrogen,* and *oxygen.* It is soluble in water and alcohol, and possesses alkaline properties. Its watery solution forms, with tincture of nutgalls, a yellow precipitate. Two grains of the acetate of jamaicina, given to pigeons and sparrows, caused restlessness and trembling, and in half an hour violent purging.

Physiological Effects.—Cathartic, emetic, and narcotic. In doses of thirty or forty grains the powder of this bark purges briskly, like jalap. In larger quantities it causes vomiting, fever, and delirium. Fatal accidents are said to have resulted from its imprudent use.

Uses.—Formerly employed as an anthelmintic, especially against the large round worm (*Ascaris lumbricoides*), but its use is now obsolete.—(For further particulars respecting the uses of Cabbage-bark, consult Dr. Wright's paper above referred to).

Administration.—Dose of the *powder*, ℈j. to ʒss. As an anthelmintic the bark is usually given in the form of decoction.

Decoctum Geoffroyæ, D. (Bark of the Cabbage-tree, bruised, ℥j.; Water, Oij. [wine measure]. Boil down to a pint, and to the strained liquor add ℥ij. of Syrup of Orange Peel). Cathartic and narcotic. Employed as an anthelmintic. Dose, f℥ss. to f℥ij. for an adult.

Antidotes.—In the event of an overdose, wash out the stomach, administer vegetable acids, and evacuate with castor oil.

Hæmatox'ylon campechia'num, L. E. D.—*The Common Logwood.*

Sex. Syst. Decandria, Monogynia.

(Lignum, *L. D.*—Wood, *E.*)

History.—Monardes (*Clusii Exot.* cap. xxvii. p. 324) calls the wood of this plant *lignum ad renum affectiones et urinæ incommoda.* Hernandez (*Rev. Med. Novæ Hisp. Thes.* 119) terms the wood *lignum nefriticum;* and describes the plant under the name of *coatli.*

Botany. *Gen. Char.*—*Sepals* five, united at the base into a somewhat persistent tube; the lobes deciduous, oblong-obtuse. *Petals* five, scarcely longer than the sepals. *Stamens* ten; *filaments* hairy at the base; *anthers* without glands. *Style* capillary. *Legume* compressed, flat, lanceolate, acuminate at both ends, one-celled, two-seeded; the sutures indehiscent; the valves bursting in the middle longitudinally. *Seeds* transversely oblong; *cotyledons* two-lobed.—*Tree,* with branches unarmed or spinous below the leaves. *Flowers* racemose, hermaphrodite (D. C.)

Sp. Char.—The only species.

Tree forty or fifty feet high. *Leaves* pinnate or somewhat bipinnate by the conversion of the lowest pair of leaflets into two pair of pinnæ; *leaflets* obovate or obcordate. *Flowers* yellow.

HAB.—Campeachy. Introduced into Jamaica, where it now grows in great abundance, wild.

COMMERCE.—The stems of the Logwood-trees are cut into logs or junks of about three feet long, the bark and white sap (alburnum) of which are chipped off, and the red part or heart (duramen) sent to England (Wright, *Med. Plants of Jamaica*). It is imported from Campeachy, Honduras, and Jamaica. In 1839 duty (3s. if from British possessions, 4s. 6d. if from other places) was paid on 15,867 tons (*Trade List*).

DESCRIPTION.—Logwood (*lignum hæmatoxyli* seu *campechianum*), as imported, consists only of the heartwood or duramen. The logs are externally of a dark colour; internally they are red. The wood is dense, has a sp. gr. of 1·057; admits of a fine polish, has a sweetish taste and a pleasant odour. Large crystals of hæmatin are sometimes found in the wood (Thomson, *Org. Chem.* 407).

COMPOSITION.—Logwood was analyzed in 1812 by Chevreul (*Ann. Chim.* lxxxi. 128), who found its constituents to be *volatile oil, hæmatin, fatty* or *resinous matter, brown substance containing tannin, glutinous matter, acetic acid, woody fibre, various salts* (phosphate, sulphate, and acetate of lime, acetate of potash, and chloride of potassium) and the *oxides* of aluminum, silicium, manganese, and iron.

Hæmatin or *Hæmatoxylin* is a red crystalline substance, of a slightly bitter, acrid, and astringent taste. It is soluble in alcohol and ether, and slightly so in water. Acids render the solution yellowish or red; alkalies give it a purple or violet colour. Alum causes a violet precipitate, and several metallic solutions (as of tin and lead) a blue one. Gelatine produces a flocculent reddish precipitate.

CHEMICAL CHARACTERISTICS.—The decoction of logwood is deep-red. Acids render it paler and brighter coloured. The alkalies give it a purplish or violet-blue colour. Acetate of lead causes a blue, alum a violet, precipitate. The salts of iron make it dark violet-blue. Gelatine forms a reddish precipitate with it.

PHYSIOLOGICAL EFFECTS.—Logwood is a mild astringent (see the effects of astringents, p. 79). It does not so readily disorder the digestive organs as some other astringents, and hence its use may be continued for a longer period. Its colouring matter becomes absorbed, and may be detected in the urine. Dr. Percival (*Works*, vol. iv. p. 386) states, that under the use of extract of logwood the urine of a female suddenly acquired a purplish-red colour, which was deepened by the sulphate of iron. After some hours the secretion returned to its natural colour. The stools sometimes acquire a purplish-red colour from the use of logwood.

USES.—In medicine logwood is employed as an astringent in old diarrhœas and dysenteries, in hemorrhages (from the uterus, lungs, and bowels), and in leucorrhœa. It is well adapted to the diarrhœas of children. Dr. Percival employed it to restrain profuse sweating in phthisis.

ADMINISTRATION.—It is employed in the form of decoction or extract.

1. *DECOCTUM HÆMATOXYLI*, E. D. (Logwood, in chips, ℥j. [℥iss. *D.*]; Water, Oj. [Oij. wine measure, *D.*]; Cinnamon, in powder. ʒj. Boil the logwood in the water down to ten fluidounces [Oj. *D.*], adding the cinnamon towards the end, and strain). Employed as an astringent in diarrhœa. Dose, for adults, f℥j. to f℥ij.; for children, fʒij. to f℥ss.

2. *Extractum Hæmatoxyli*, L. E. D. (Logwood, powdered [in chips, *E.*; raspings, *D.*], lb. ijss. [lb. j. *E.*]; Boiling [distilled, *L.*] Water, *Cong.* ij. [*a gallon, E.*] Macerate for twenty-four hours, then boil down to a gallon [Oiv. *E.*], and strain the liquor while hot; lastly, evaporate [in the vapour-bath, *E.*] to a proper consistence).—"For preparing this extract the logwood should not be powdered, but rasped, and it should be so far evaporated as to become brittle and pulverulent when cold. One *cwt.* of the wood yields about twenty lbs. of extract" (Brande, *Man. of Pharm.*)—Astringent. Employed in old diarrhœas, dysenteries, &c. Dose, grs. x. to ℨss. By keeping extract of logwood becomes exceedingly hard, and pills made of it are said to have passed through the bowels undissolved. It is employed, I am informed, to colour snuff.

Tamarin'dus in'dica, Linn. L. E.—*Common Tamarind-Tree.*

Tamarin'dus ind'icus, *D.*

Sex. Syst. Monadelphia, Triandria.

(Leguminis pulpa, *L. D.*—Pulp of the pods, *E.*)

History.—The tamarind does not appear to have been known to the ancient Greeks; at least no mention is made of it in their writings. We are indebted for its introduction to the Arabians, who probably derived their knowledge of it from the Hindus. Mesue, Avicenna, and Serapion, are the earliest writers who mention it. It is said to have derived its name from *Tamar* (which, in Arabic, signifies *dates* or *fruit*), and *Indus*, in reference to its Indian origin.

Botany. *Gen. Char.*—*Calyx* tubular at the base; limb bilabiate, reflexed; upper lip three-partite; lower broad, two-toothed. *Petals* three, alternating with the segments of the upper lip of the calyx; two of them ovate, the middle one cucullate. *Stamens* nine or ten; seven very short and sterile, the others (two or three) longer, monadelphous, bearing anthers. *Style* subulate. *Legume* stalked, linear, more or less curved, slightly compressed, one-celled, three to twelve-seeded, the sarcocarp pulpy. *Seeds* compressed, bluntly four-angled, obliquely truncated at the hilum.—*Trees.* *Leaves* abruptly pinnated; *leaflets* many pair. *Flowers* racemose (Wight and Arnott).

Sp. Char.—The only species.—*Tree*, thirty to forty feet high. *Branches* spreading. *Leaves* alternate; *leaflets* twelve to fifteen pair, small, oblong, obtuse, entire, smooth. *Petals* deciduous, yellow, veined with red.

There are two varieties, considered by Gærtner, Roxburgh, and Decandolle, as distinct species. The only difference between them is in the pod.

α. *Orientalis.* *T. indica*, Decandolle. *East Indian Tamarind.*—*Legume* elongated, six or more times longer than broad, six- to twelve-seeded.

β. *Occidentalis.* *T. occidentalis*, Decandolle. *West Indian Tamarind.*—*Legume* abbreviated, scarcely three times longer than broad, one- to four seeded.

Hab.—East and West Indies.

Preservation of the Fruit.—The usual mode of preserving tamarinds in the West Indies is, to remove the shell or epicarp from the ripe fruit, and to place layers of the shelled fruit in a cask, and pour boiling water over them. But Dr. Wright (*Med. Plants of Jamaica*) says, a better method is, to put alternate layers of tamarinds and powdered sugar in a stone jar. The drier and dark-coloured East Indian tamarinds are said to be preserved without sugar.

Description.—Tamarinds are imported both raw and preserved. *Tamarind pods* are from three to six inches long, more or less curved. Composed of a dry, brittle, brown, external shell (*epicarp*), within which is the acidulous, sweet, reddish-brown pulp (*sarcocarp*) penetrated by strong fibres. Still more internal is a thin membranous coat (*endocarp*) inclosing the oval brown seeds. *Preserved tamarinds* (*tamarindi conditi*) consist of the same parts, the shell (*epicarp*) excepted. The *pulp* (*pulpa tamarindi*) is the officinal part.

Composition.—Tamarind pulp was analyzed, in 1790, by Vauquelin (*Ann. Chim.* v. 92), who obtained the following products:—*citric acid* 9·40, *tartaric acid* 1·55, *malic acid* 0·45, *bitartrate of potash* 3·25, *sugar* 2·5, *gum* 4·7, *vegetable jelly* (pectin) 6·25, *parenchyma* 34·35, *water* 27·55.

Physiological Effects.—Tamarind pulp allays thirst, is nutritive and refrigerant, and, in full doses, laxative. From this combination of refrigerant and laxative properties it is commonly denominated *a cooling laxative.*

Uses.—Tamarinds are adapted for febrile and inflammatory cases: in the former it is often taken with the double purpose of operating as a refrigerant and acting gently on the bowels. An infusion of tamarinds forms a very pleasant, cooling drink, as does also tamarind whey. Tamarinds are a constituent of several mild purgative preparations. It is frequently given in conjunction with senna (as in the *confection of senna* and the *infusion of senna with tamarinds*, Ph. D.) It is said, though I know not with what truth, that the addition of tamarinds to senna and resinous cathartics diminishes the operation of the latter.

Administration.—The dose of tamarinds is from ℨij. to ℥j. or more. *Tamarind whey* (*serum lactis tamarindatum*) is prepared by boiling ℥ij. of tamarind pulp with Oij. of milk.

Cas'sia, Linn.—*Several Species yielding Senna.*

Cassia lanceolata, *Dec.* and C. obovata, *Dec. L.*

Various Species of Cassia, probably C. lanceolata, *Forskal*, C. acutifolia, *Delile*, and C. obovata, *Colladon*, *E.* Cassia elongata, *Lemaire-Lisancourt*, *E.*

C. Senna, *Linn. D.*

Sex. Syst. Decandria, Monogynia.

(Folia, *L. D.*—Leaves, *E.*)

History.—Reiske (*Diss. inaug. exhib. miscell. aliquot observ. Med. ex Arabum Monumentis*, Lugd. 1746) states, on the authority of an oriental work (*De Medicina Prophetæ Arabici*), that senna was employed by Mahomet. If this be correct (and we may reasonably entertain some doubt, since the Arabic word which he translates senna has been by other linguists, as Golius and Warner, rendered cumin), this purgative was in use some centuries before any mention of it is made in the works of pharmacological writers. Among the Arabians I may quote Mesue, Serapion, and Avicenna, who notice senna (sene), but they refer to the fruit, and not to the leaves. Mesue, in speaking of the decoction of senna, quotes Galen, and from this, as well as from other circumstances, it has been imagined that Dioscorides and Galen, and probably even Theophrastus, were acquainted with senna; but their known writings do not warrant this opinion, and hence the quotation is presumed to be erroneous. The earliest Greek writer, in whose works senna is mentioned, is Actuarius; but he, like the Arabians, referred to the fruit.

BOTANY. *GEN. CHAR.*—*Sepals* five, scarcely united at the base, more or less unequal. *Petals* five, unequal. *Stamens* ten, free, unequal; the three lower ones longer, the four middle ones short and straight, the three upper ones with abortive anthers. *Anthers* dehiscing at the apex. *Ovary* stalked, frequently arched. *Legume* various.—*Trees, shrubs,* or *herbs. Leaves* simply and abruptly pinnate. *Petioles* frequently glanduliferous. *Leaflets* opposite.

SPECIES.—Some confusion still exists as to the species yielding the senna leaves of commerce. Linnæus made but one species, which he termed *Cassia Senna*, and considered the acute and obtuse-leaved plants as mere varieties. This error has been adopted by the *Dublin College*. The usually-accurate Woodville (*Med. Bot.* vol. iii. p. 446) has published a plate representing the leaflets of the acute-leaved Cassia, and the fruit of the blunt-leaved species. The following perhaps are distinct species, but their specific characters are not in all cases accurately ascertained.

1. C. OBOVA'TA, *Colladon, Hist. des Casses*, 92. C. Senna var. β. *Linn.* C. obtusa, *Roxb. Fl. Ind.* ii. 344. Sena belledy (Wild Senna) *Egyptians* and *Nubians*. Séné de la Thébaïde; Cassia Sena, *Nectoux*, Pl. i.—*Leaflets* six to seven pairs, obovate, obtuse; petiole glandless. *Legumes* plano-compressed, curved, tumid by the crests on the middle of each valve (D. C.)—Perennial *herb*, one to two feet high. *Leaves* smooth; *leaflets* mucronate, unequal at the base. *Stipules* lanceolate, linear, spreading. *Flowers* yellow in racemes. *Legumes* oblong, falcate, smooth, rounded at each end, with an equally interrupted ridge along the middle of each valve.—Egypt (Bassà-Tine at the entrance of the valley of Egaremont, two leagues from Cairo; Karnak; Thebes; on the eastern bank of the Nile opposite Hermonthis; Esneh; Edfou; Daraou; Assouan) Nubia; Desert of Suez; Syria; India. Cultivated in Italy, Spain, Jamaica, &c.—Its leaflets form *Aleppo*, *Senegal*, and *Italic Senna*, and one of the constituents of *Alexandrian Senna*.

Nees and Ebermaier (*Handb. d. Med. Pharm. Bot.* ii. 207) follow Hayne, in admitting two species of blunt senna, viz. *C. obovata*, Hayne, with obovate very shortly pointed leaflets, and *C. obtusata*, Hayne, with more remote, obovate, truncated, emarginate leaflets. I think, with Th. Martius, (*Pharmakogn.*) that the latter are merely older leaflets than the former.

2. C. ACUTIFO'LIA, *Delile, Fl. Ægypt.* Pl. 27, fig. 1.—*Stem* suffruticose. *Leaves* pinnate; *petiole* glandless; *leaflets* five to seven pairs, lanceolate, acute. *Legumes* flat, elliptical, naked on both sides, somewhat bent on the upper margin (Delile).—An *undershrub*, about two feet high. *Leaves* when young slightly silky or pubescent. *Flowers* yellow, in axillary racemes, at the top of the branches. *Petals* obovate. *Legumes* somewhat swollen by the seeds. *Seeds* six or seven in each legume.—Egypt, in the valleys of the desert to the south and east of Assouan.—Collected by the Arabs, and sold by them to merchants who convey it to Cairo.

3. C. ELONGA'TA, *Lemaire-Lisancourt, Journ. de Pharm.* vii. 345; *Fée, Journ. de Chim. Méd.* vi. 234; C. lanceolata, *Royle Illustr.* t. 37. Perhaps identical with the preceding species. Dr. Royle's specimens

were raised from seeds picked out of *Mecca Senna*. Dr. Lindley thus describes the plant. "An *annual*, but, with care, it may be made to live through the year, and to assume a suffruticose habit. *Stem* erect, smooth. *Leaves* narrow, equal pinnated; *leaflets* four to eight pairs, lanceolate, nearly sessile, slightly mucronulate, smooth above, rather downy beneath, with the veins turning inwards, and forming a flexuose intramarginal line; *petioles* without glands; *stipules* softly spinescent, semihastate, spreading, minute. *Racemes* axillary and terminal, erect, stalked, rather longer than the leaves; *pedicels* without bracts. *Sepals* linear, obtuse. *Petals* bright-yellow. Of the *stamens* the five lowest sterile and small, the two next large, curved, and perfect, the three uppermost minute and gland-like. *Ovary* linear, downy, falcate, with a smooth recurved *style*. *Legumes* pendulous oblong, membranous, about an inch and half long, and five-eighths broad, quite straight, tapering abruptly to the base, and rounded at the apex, deep-brown, many-seeded."—Grows in India, but probably only naturalized.—Yields *Tinnevelly* and *Mecca Senna*.

4. C. ÆTHIOP'ICA, *Guibourt*, *Hist. des Drog*. 3rd ed. ii. 219; *C. ovata*, *Mérat*, *Dict. Mat. Med.* vi. 311; Séné de Nubie; C. lanceolata, *Nectoux*, *Voy. dans la Haute Egypte*, t. ii.; C. Senna, Stevenson and Churchill, *Med. Bot.* i. fig. 30.—*Leaves* of three to five pairs of leaflets; *petioles* with a gland at their base, and another between each pair of leaflets; *leaflets* oval-lanceolate, pubescent. *Legumes* flat, smooth, not reniform, rounded, naked on both sides, containing from three to five seeds.—About eighteen inches high. *Leaflets* from seven to nine lines long, and from three to four broad, consequently less elongated and less acute than those of the two preceding species. *Legumes* from eleven to fifteen lines long, of a pale or fawn colour.—Nubia, Fezzan, to the south of Tripoli, and probably in Ethiopia. Yields *Tripoli Senna*. I think I have detected the leaflets in *Alexandrian Senna*.

5. C. LANCEOLA'TA, *Forskal*, *Fl. Ægypt. Arab.* 85; *Lindley*, *Fl. Med.* 259.—Dr. Lindley, who met with this species in a collection of Arabian plants made by Dr. S. Fischer, says, "the *leaflets* are in four or five pairs, never more; oblong, and either acute or obtuse, not at all ovate or lanceolate, and perfectly free from downiness even when young; the petioles have *constantly* a small round brown gland a little above the base. The *pods* are erect, oblong, tapering to the base, obtuse, turgid, mucronate, rather falcate, especially when young, at which time they are sparingly covered with coarse scattered hairs."—This species is therefore distinct from both *C. acutifolia*, Delile, and *C. elongata*, *Lemaire*. Forskäl says it grows about Surdud, Mor, and Abuarish; and that it is the *true Mecca Senna*.

6. C. MARILAN'DICA, Linn.—*Leaflets* eight to nine pairs, ovate-oblong, mucronate, equal, with an ovate gland at the base of the petiole. *Racemes* axillary, many-flowered, shorter than the leaves. *Legumes* compressed, linear, hispid, subsequently smoothish (D. C.)—From three to six feet high. *Flowers* golden-yellow.—United States; common in all parts south of New York.—Yields the *American Senna*.

COMMERCE.—Senna is imported from the Mediterranean (either directly from Egypt, or at second hand from Italy), and from the East Indies (Madras and Bombay), usually in bales. The duty is 6d. per lb. The quantities on which duty was paid, during the two last years, are as follows:—

	1838.	1839.
From East Indies	72,576 lbs.	110,409 lbs.
From other places	69,538 lbs.	63,766 lbs.
Total imported	142,114 lbs.	174,175 lbs.

DESCRIPTION.—Senna (*folia sennæ*) has a peculiar, agreeable, tea-like odour, and a nauseous, bitter taste. Its colour should be bright and fresh. If largely mixed with extraneous matter, if it be much broken or very dusty, it should be rejected. Boiling water extracts about a third of its weight. Proof spirit yields a brown—alcohol or ether a green tincture.

1. *Alexandrian Senna* (*Senna Alexandrina; Folia Sennæ Alexandrinæ*).—Called by the French *Séné de la Palthe* (i. e. *Tribute Senna*) because it is obliged to be sold to the Egyptian government, who resell it to Europeans. It is imported in bales from Alexandria and other Mediterranean ports. It consists of the leaflets of two or more species of *Cassia* (*C. acutifolia*, *C. obovata*, and, I think, sometimes, *C. æthiopica*) mixed always with the leaves of *Cynanchum Argel* (see p. 944), and sometimes with those of *Tephrosia Apollinea*. The flowers and fruits of these plants are usually present in greater or less quantity. Alexandrian senna is collected in Nubia and Upper Egypt, and is conveyed down the Nile to the great depôt at Boulak.

For the following particulars I am indebted to the writings of Delile (*Mém. sur l'Egypte*, vol. iii. p. 315, 1799, and *Fl. Ægypt.*), Rouillure (*Ann. Chim.* lvi. 161), Nectoux (*Phil. Mag.* xv. 55, and *Voyage dans la Haute Egypte*, 1808), and Burckhardt (*Travels in Nubia*, pp. 22 and 49, 2nd ed.)

Senna is collected by the Arabs of the tribe of Abaddeh. They may take two crops annually,—the most productive one is that after the rain in August and September; the second takes place about the middle of March. When cut the plants are spread out on the rocks, and dried in the sun (Nectoux).

Assouan is the first entrepôt for senna. It receives all that is gathered in the neighbourhood. Esneh is another entrepôt. It receives the acute-leaved senna from Abyssinia, Nubia, and Sennaar, from whence it arrives by the caravans which convey negroes to Egypt, and blunt-leaved senna, gathered in Upper Egypt (Rouillure). Daraou, between Assouan and Esneh, is also an entrepôt; but the great depôt is at Boulak, the port of Cairo. Here the monopoly of senna is farmed out by Mahommed Ali to Rosetti, an Italian, for about £3,500 per annum (Burckhardt). The senna arrives at Boulak from Assouan, not only by the Nile, but also by way of Cossier, the Red Sea, and Suez. As, however, the latter is a more expensive route, it is not so frequently followed (Nectoux). Lastly, some senna is carried to Boulak by the caravans from Mount Sinai. The following are said by Rouillure to be the quantities brought from these places:—

Quintals.

	Acute-leaved Senna.	*Obovate ditto.*	*Ethiopic ditto.*	*Argel leaves.*
From Assouan	7,000 to 8,000	500 to 600	....	2,000 to 2400
From Esneh	....	800	2,000	....
From Suez & Mount Sinai	....	1200 to 1500	....	....
Total of each kind..	7,000 to 8,000	2,500 to 2,900	2,000	2,000 to 2,400

So that the total amount of all kinds is, according to this statement, 13,500 to 15,300 quintals.

The mixture of the different leaves takes place at the entrepôts. Nectoux mentions those of Kénéh, Esneh, Daraou, and Assouan, where it is effected. Rouillure says that at Boulak, 500 parts of acute leaves are mixed with 300 of obtuse leaves and 200 of Argel leaves.

From Boulak the senna is sent to Alexandria, and from thence is shipped to Europe.

Alexandrian senna has a greyish-green colour, an odour which somewhat resembles that of tea, and a viscid taste. It presents a broken appearance, and on examination is found to consist of the leaves, flowers, and fruits of the above-mentioned plants mixed with various extraneous matters (as seeds, date-stones, rabbit-dung, stones, &c.) The latter are in great part separated by hand-picking, sifting, &c. before the senna is fitted for use. It then constitutes *picked Alexandrian senna* (*folia sennæ alexandrinæ electæ*).

(*a.*) *Cassia leaflets, flowers, and legumes.*—The *leaflets* of Cassia are readily distinguished from those of other genera found in senna, by being unequal-sided; that is, by the two sides of the leaflet being unequal in size, shape, or length, and by the veins or nerves of their under surface being very conspicuous. The acute-leaved are very readily distinguished from the blunt-leaved species, by their shape. The dried *flowers* of Cassia may be easily detected; they are dull-yellow. I have not been able to make out their species. The *legumes* of the obovate and acute-leaved Cassia are also found; they are distinguished by the botanical characters before described.

FIG. 212.

Legume and leaflet of *Acute-leaved Alexandrian senna.*

FIG. 213.

Legume and leaflet of *C. obovata.*

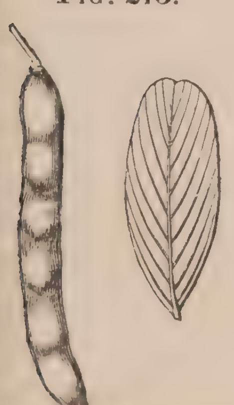
(*b.*) *Argel leaves, flowers,* and *fruit.*—The Argel plants are collected by the Arabs, in the valleys of the desert to the east and south of Assouan (Delile). The *leaves* found in Alexandrian senna are distinguished from the senna leaflets by their being equal-sided,—by the absence, or imperfect development of the lateral nerves,—by their paler colour, thicker and more coriaceous texture,—by a yellowish exudation frequently found on them,—and generally, though not invariably, by their greater length. By careful picking the *flowers* may be detected: they are white, and in small corymbs. The *fruit*, as found in Alexandrian senna, seldom exceeds in size that of a good-sized orange-pip. It is an ovoid follicle, tapering superiorly, brown, shrivelled, and contains several seeds.

FIG. 214.

Argel leaves and fruit.

(*c.*) *Tephrosia leaflets* and *pods.*—The *Tephrosia Apollinea* (*Galega Apollinea*, Delile, pl. 53) grows in cultivated fields near the Nile, at Hermonthis, at Edfou, and in the Elephantine island, opposite Assouan. The *leaflets* have a silky or silvery aspect; they are obovate-oblong, somewhat cuneiform, emarginate, equal-sided, tapering towards the base; its lateral veins parallel, regular, and oblique to the midrib. These leaves are usually found folded longitudinally, and are very apt to be overlooked. The *legume* is from an inch to an inch and a half long, not exceeding two lines broad, linear, slightly ensiform, and contains six or seven brownish seeds.

FIG. 215.



Legume and leaflet of *Tephrosia apollinea.*

2. TRIPOLI SENNA. *Senna Tripolitana; Folia Sennæ Tripolitanæ.* — It is carried to Tripoli in caravans, which go from Fezzan. In general appearance it resembles Alexandrian senna; but the leaflets are more broken, smaller, less acute than the acute-leaved Alexandrian senna, thinner, greener, and of a

less herbaceous odour. They are the produce of *C. Æthiopica*, usually unmixed with any other species. But I have a sample which contains also the leaflets of *C. obovata* and Argel leaves.

Tunis senna agrees with that of Tripoli.

3. *Aleppo Senna.*—Consists of the leaflets of *C. obovata.*

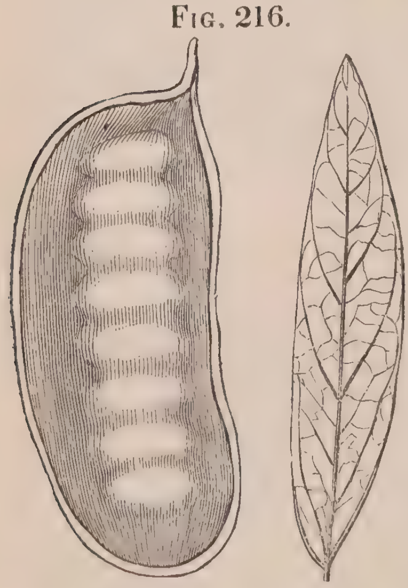
4. *Senegal Senna.* (*Senna Senegalensis*).—Is a blunt-leaved senna, having a rougher and more glaucous appearance than the leaflets of *C. obovata*. Some years since a small bale of it was sent by the French *ministre de la marine* to M. Henry for examination (*Journ. de Pharm.* xiv. 70). I am indebted to the kindness of Professor Guibourt for a sample of it.

5. *Smyrna Senna.*—Very similar to Tripoli senna, but some of the leaflets resemble the acute-leaved Alexandrian senna.

6. *Mecca Senna.* (*Senna Meccensis; Inferior* or *Second East Indian Senna; Séné Moka*, Guibourt; *Séné de la Pique* or *Pike Senna; Suna Mukkee*, Royle.—Imported into England from India. It is the produce of Arabia, and finds its way into the interior of India by the ports of Surat and Bombay. Dr. Royle was informed that it was grown somewhere in the Agra and Muttra district, but was never able to prove the fact (*Illustr.* 187). It occurs in long narrow leaflets, of from one inch to an inch and a half long, narrower than those of Tinnevelly senna, and of a yellowish colour; some of the leaflets being brownish, or even blackish. This change of colour is probably the result of the action of a moist atmosphere. Legumes are occasionally intermixed: they are from one and a half to three inches long, and from seven to eight lines broad; slightly curved, greenish in their circumference, blackish in their centre, with a smooth surface.

7. *Tinnevelly Senna.* (*Finest East Indian Senna; Séné de l'Inde*, Guibourt).—Cultivated at Tinnevelly, in the southern part of India, by Mr. G. Hughes. It is a very fine unmixed senna, which is extensively employed, and fetches a good price. It consists of large, thin, unbroken leaflets, of a fine green colour, from one to two inches, or more, long, and sometimes half an inch broad at their widest part. When exposed to a damp atmosphere they are very apt to change colour, and to become yellow or even blackish. I have never seen legumes intermixed.

Fig. 216.



a. Legume of Tinnevelly Senna (*C. elongata.*)
b. Leaflet of ditto (*Royle.*)

8. *American Senna.*—Is the produce of *Cassia Marilandica*, but never reaches this country as an article of commerce. That which I have received was prepared by the Shakers of the United States, and has been compressed into an oblong cake. The leaflets are oblong, lanceolate, from one and a half to two inches long, and from a quarter to half an inch broad, thin, pliable, and of a pale-green colour. They have a feeble odour and a nauseous taste, like the other sennas.

Adulteration.—Senna is not, to the best of my belief, adulterated in this country. The leaflets of *Colutea arborescens* or *Bladder Senna* have, on the continent, been occasionally intermixed. They are elliptical, regular, and obtuse. Their regularity at the base would at once distinguish them from the leaflets of *C. obovata.*

Argel leaves, mixed with a few leaflets of *C. acutifolia*, I have known to be recently sold as *picked senna.* It was done rather from ignorance than fraud.

FIG. 217.

Leaf of *Coriaria myrtifolia.*

A serious adulteration has been sometimes practised on the continent, by the substitution of the leaves of *Coriaria myrtifolia* for those of senna (*Journ. de Chim. Méd.* i. 284). They are ovate-lanceolate, grayish-green with a bluish tinge, three-nerved, with a strongly marked midrib; the two lateral nerves disappear towards the summit of the leaves. Chemically these leaves are distinguished by their infusion yielding, with gelatine, a whitish precipitate (*tannate of gelatine*), and with sulphate of iron, a very abundant blue precipitate (*tannate of iron*). Furthermore, it forms precipitates with bichloride of mercury, emetic tartar, and chloride of barium.

COMPOSITION.—Three analyses of senna have been made; viz. one in 1797, by Bouillon La Grange (*Ann. Chim.* xxiv. 3); a second by Braconnot (*Journ. Phys.* lxxxiv. 281), and a third, in 1821, by Lassaigne and Feneulle (*Ann. Chim. et Phys.* xvi. 16):—

Senna Leaves.			*Senna Pods.*
Braconnot.		*Lassaigne and Feneulle.*	*Feneulle.*
Bitter matter of senna	53·7	Cathartin.	Cathartin.
Reddish-brown gum	31.9	Yellow colouring matter.	Yellow colouring matter.
Matter similar to animal mucus, precipitable by acids	6·2	Volatile oil.	Volatile oil.
		Fixed oil.	Fixed oil.
		Albumen.	Albumen.
Acetate of lime	8·7	Mucus.	Gum.
Malate (or some other vegetable salt) of lime	3·7	Malic acid.	Malic acid.
		Malate and tartrate of lime.	Malates of potash and lime.
		Acetate of potash.	Mineral salts.
Acetate of potash } Chloride of sodium }	traces	Mineral salts.	Silicic acid.
		[Insoluble matter (lignin, &c.)]	Lignin.
Watery extract of Alexandrian senna	104·2	Alexandrian senna.	Legumes of Cassia acutifolia.

1. *Odorous principle* or *Volatile Oil of Senna.*—Obtained by submitting the leaves, with water, to distillation. It has a nauseous odour and taste. The distilled water of senna, which contains some oil in solution, acts as a mild purgative only.

2. *Cathartine* or *Purgative Principle of Senna.*—Yellowish-red, uncrystallizable, with a peculiar odour, and a bitter, nauseous tate; very soluble both in water and alcohol, but insoluble in ether; it attracts water from the air. Its aqueous solution is precipitated by infusion of galls and diacetate of lead. The sesquisulphate of iron and alkalies deepen the colour of the infusion: chlorine decolorizes it: iodine, acetate of lead, gelatine, and emetic tartar, cause no precipitates with it. It appears to consist of *carbon*, *hydrogen*, and *oxygen* only. Three grains caused nausea, griping, and purging.

CHEMICAL CHARACTERISTICS.—By boiling senna in water,—by the exposure of infusion of senna to the air, as well as by the action of the mineral acids and of chlorine on the infusion,—a precipitate is procured. Bouillon La Grange regarded this as a species of resin, formed by the union of oxygen with a peculiar kind of extractive found in senna. This extractive, he says, is inert, but becomes active when converted into resin; and hence, the cold infusion, according to this chemist, causes colic, but rarely purges. The carbonated alkalies, lime water, nitrate of silver, the acetates of lead, sulphate of iron, &c. form precipitates with the infusion of senna.

Physiological Effects. (*a.*) *On animals.*—In doses of five or six ounces it purges horses. Courten (Wibmer, *Wirk. Arzneim. ü. Gifte*, iii. 67) threw an infusion into the veins of a dog; it quickened the respiration, and caused vomiting. The animal appeared weak, was dull, and had no inclination to eat.

(*b.*) *On man.*—Regnandot (Wibmer, *op. supra cit.*) injected half a spoonful of weak luke-warm infusion of senna into the left median vein of a young man affected with an herpetic eruption. The only effect produced was a slight temporary headache. Some days afterwards a spoonful was injected: in half an hour violent shivering and vomiting came on, which were followed by heat and purging. The febrile symptoms continued for several hours. Taken by the stomach senna acts as a sure and safe purgative. Its ill effects are nausea, griping, flatulence, and, at first, depression, afterwards excitement of the pulse. It appears to stimulate the abdominal and pelvic vessels, thereby having a tendency to promote the hemorrhoidal and menstrual discharges. It is one of the mildest of the drastic purgatives. Unlike scammony, gamboge, jalap, and most other drastics, it does not rank among poisons, even when given in large doses. It is distinguished from the saline purgatives by its stronger and more irritant operation, by the heat, gripings, and increased frequency of pulse, which attend its purgative action. From rhubarb it differs in being more powerful and irritant in its operation, in being nearly or quite devoid of any tonic operation. It acts more speedily and powerfully than aloes, and in a less marked manner on the large intestines. In its operation it appears to rank between jalap and aloes.

The petioles and stalks possess similar properties to the leaflets. Formerly the griping quality of senna was ascribed to the stalks, but both Bergius (*Mat. Med.* i. 354) and Schwilgué (*Traité de Mat. Méd.* ii. 410) have proved the error of this notion. The legumes are much milder in their operation than the leaflets.

Good East Indian Senna is almost, if not quite, as active as the Alexandrian. Mr. Twining (*Trans. Med. and Phys. Soc. of Calcutta*, vol. v. p. 433), after extensively trying it, declared it equal to the best he had ever seen. The obovate senna appears to be milder than the acute-leaved. The Senegal senna, before referred to, was found to possess less activity than ordinary senna. Part of the acrid and griping qualities of Alexandrian senna are referrible to the Argel leaves, which, according to the observations of Rouillure, Delile, Nectoux, and Pugnet (quoted by Delile) possess greater activity than the true senna leaves. Rouillure says they purge and gripe, and are used by the Arabs of Upper Egypt, without the addition of senna. These effects might be expected from the known properties of Asclepiadaceæ (see p. 903.) "American senna is an efficient and safe cathartic, closely resembling the imported senna in its action, and capable of being substituted for it in all cases in which the latter is employed." (*United States Dispensatory.*)

If infusion of senna be given to the nurse, the suckling infant becomes purged—a satisfactory proof that the cathartic principle of senna becomes absorbed, and is thrown out of the system by the excretories. Furthermore, as purging results from the injection of infusion of senna into the veins, this cathartic would appear to exercise a specific influence over the bowels, independent of its local action on these when it is swallowed.

Uses.—Senna is well adapted for those cases which require an active and certain purgative, with a moderate stimulus to the abdominal and pelvic viscera. Thus, *in constipation* and *inactivity of the alimentary canal*, requiring the continued or frequent use of purgatives; *in worms; in determination of blood to the head*, and many other cases which readily suggest themselves, senna answers very well. The circumstances contra-indicating its use are,—an inflammatory condition of the alimentary canal, a tendency to hemorrhoids or menorrhagia, threatening abortion, prolapsus of the uterus or rectum, &c. The objections to its use are,—the large dose required, the nauseous and disgusting flavour, the tendency to gripe, and the irritant and stimulant operation. Thus, in inflammation of the mucous membrane of the bowels, the irritant action of senna makes it an objectionable purgative; while its tendency to increase the frequency of the pulse renders it less fit for exhibition in febrile disorder than the saline purgatives. It is a very safe purgative, and may be given to children, females, and elderly persons, with great security. Though it is not the most appropriate purgative to be employed after delivery, and operations about the abdomen or pelvis (as hernia and lithotomy), yet I have repeatedly seen it used, and rarely with any unpleasant consequences.

Administration.—Powder of senna may be given in doses of from ʒss. to ʒij. for adults. There are two objections to its uses,—the great bulk of the necessary dose, and the uncertainty of its operation, arising from its liability to decompose by keeping. To cover the unpleasant flavour of senna, Dr. Paris (*Pharmacologia*) recommends the addition of bohea (black) tea. Coffee has been advised by others. Aromatics (especially coriander and ginger) are frequently added to prevent griping, and to improve the flavour.

1. *Infusum Sennæ compositum*, L. D. *Infusum Sennæ*, E. *Senna Tea.*—(Senna, ʒxv. [℥iss. *E.* ℥j. *D.*]; Ginger, bruised, iv. [ʒj. *D.*]; Boiling [distilled, *L.*] Water, Oj. [wine measure, *D.*] Macerate for an hour in a vessel lightly covered, and strain [through linen or calico, *E.*]) An ordinarily-used purgative, employed frequently in the maladies of children as well as of adults. A saline purgative (sulphate of magnesia or of soda, or potash-tartrate of soda, or tartrate of potash) is usually given in conjunction with it; manna and tincture of senna being frequently added. A compound of this kind is familiarly called the *black draught*. The dose of infusion of senna is from f℥ij. to f℥iv. for adults.

2. *Infusum Sennæ compositum*, E. *Infusum Sennæ cum Tamarindis*, D.—(Senna, ʒj.; Tamarinds, ℥j. Coriander, bruised, ʒj.; Muscovado, ʒss. [Brown Sugar, ℥j. *D.*]; Boiling Water, f℥viij. Infuse for four hours, with occasional stirring, in a covered vessel, not glazed with lead; and then strain through linen or calico. This infusion may be likewise made with twice or thrice the prescribed quantity of senna, *E.*)—A vessel not glazed with lead is directed, lest the acid of the tamarinds should dissolve the metal of the glazing, and thereby give a noxious impregnation. This cathartic somewhat resembles Sydenham's *potio cathartica lenitiva*. The unpleasant flavour of the senna is agreeably covered by the tama-

rinds and sugar. This preparation is cathartic and refrigerant. It is employed as a cathartic in febrile disorders. Dose, f℥ij. to f℥iv.

3. *Enema Catharticum*, E. (See p. 1048).

4. *Tinctura Sennæ composita*, L. E. D. *Elixir Salutis.*—(Senna, ℥iijss.; Caraway, bruised, ʒiijss.; Cardamoms, bruised, ʒj.; Raisins, ℥v.; Proof Spirit, Oij. Macerate for fourteen days, and strain, *L.*—Senna, lb. i.; Caraway, bruised, ℥ss.; Cardamom seeds, bruised, ℥ss.; Proof Spirit, *Cong.* i. (wine measure). Macerate for fourteen days, and filter, *D.*—Sugar, lb. iss.; Coriander, bruised, ℥vj.; Jalap, in moderately-fine powder, ℥ivss.; Senna, lb. ij¼.; Caraway, bruised; Cardamom seeds, bruised, of each ℥ivss.; Raisins, bruised, lb. ij¼.; Proof Spirit, *Cong.* i. and Ovjss. Digest for seven days, strain the liquor, express strongly the liquor, and filter the liquids. This tincture may be more conveniently and expeditiously prepared by percolation, as directed for the compound tincture of cardamom [p. 696].—If Alexandrian Senna be used for this preparation it must be freed from Cynanchum [Argel] leaves by picking, *E.*)—Carminative, cordial, stomachic, and purgative. Usually employed as an adjunct to the infusion of senna. If given alone as a purgative the dose should be f℥ss. to fʒj. It is useful in costiveness attended with flatulence.

5. *Syrupus Sennæ*, L. E. (Senna, ℥ijss.; Fennel, bruised, ʒx.; Manna, ℥iij.; Sugar, ℥xv.; Boiling Water, Oj. Macerate the Senna and Fennel in the Water with a gentle heat, for an hour. Mix the Manna and Sugar with the strained liquor; then boil down to a proper consistence, *L.*—Senna, ℥iv.; Boiling Water, Oj. and f℥iv.; Treacle, ℥xlviij. Infuse the senna in the water for twelve hours; strain, and express strongly through calico, so as to obtain a pint and two fluidounces at least of liquid. Concentrate the treacle in the vapour-bath as far as possible, or till a little taken out upon a rod becomes nearly concrete on cooling; and, while the liquor is still hot, add the infusion, stirring carefully, and removing the vessel from the vapour-bath as soon as the mixture is complete.—If Alexandrian Senna be used for this preparation, it must be carefully freed of Cynanchum [Argel] leaves by picking it, *E.*)—Cathartic. Given to children in doses of fʒj. to fʒiij.

6. *Confectio Sennæ*, L. *Electuarium Sennæ*, E. D. *Electuarium Lenitivum; Lenitive Electuary.*—(Senna, ℥viij.; Figs, lb. i.; Tamarind pulp; Cassia pulp; Prune pulp, of each, lb. ss.; Coriander, ℥iv.; Liquorice, ℥iij.; Sugar, lb. ijss.; Water, Oiij. Rub the Senna with the Coriander, and by a sieve separate ten ounces of the mixed powder. Then boil down the Water, with the Figs and Liquorice added, to half. Evaporate the strained liquor in a water bath, until of the whole twenty-four fluidounces remain; then the sugar being added, let a syrup be made. Lastly, gradually rub the Pulps with the Syrup, and having thrown in the sifted powder, mix them all, *L.*—The *Edinburgh College* omits the Tamarind and Cassia pulps, but employs lb. i. of Prune pulp and Oiij¼. of Water. The *Dublin College* employs, Senna leaves, in a very fine powder, ℥iv.; Pulp of Prunes, lb. i.; Pulp of Tamarinds, ℥ij. Treacle, Oiss.; Essential Oil of Caraway, ʒij. Boil the pulps in the syrup to the thickness of honey, then add the powder, and when the mixture has grown cold, add the oil; lastly, mix them all together, *D.*)

The preparation of this compound being troublesome and expensive and sophistications of it not being readily detectable, it is rarely prepared, in commerce, as directed by the London and Edinburgh Colleges. Jalap is frequently substituted, partially or wholly, for the senna and cassia pulp. Dr. Paris mentions walnut liquor as a colouring ingredient in use; and adds, that a considerable quantity of this confection is made in Staffordshire, in which unsound and spoilt apples enter as a principal ingredient. When properly prepared, it is a pleasant, mild, and very effectual purgative, and is frequently employed by pregnant women, persons afflicted with hemorrhoids or diseases of the rectum. When given alone in a full dose it is apt to gripe. Dose, ℥j. to ℥vj. It is frequently employed as a vehicle for the exhibition of other cathartics; for example bitartrate of potash.

Cas'sia Fis'tula, Linn. L. E. D.—*The Pudding-Pipe Tree* or *Purging Cassia.*

Cathartocar'pus Fis'tula, *Persoon.*

Sex. Syst. Decandria, Monogynia.

(Leguminum Pulpa, *L.*—Pulp of the Pods, *E.*—Pulpa Leguminis, *D.*)

History.—The earliest writers in whose works we find the fruit of Cassia Fistula mentioned, are the Arabians, Mesue, Serapion, and Avicenna. The first Greek writer who notices it is Actuarius, who terms it *κασσια μελαινα*, or *black cassia* (lib. v.)

Botany. *Gen. Char.*—See Cassia (p. 1162).

Sp. Char.—*Leaflets* four to six pairs, ovate, somewhat acuminate, smooth; *petioles* glandless. *Racemes* lax, without bracts. *Legumes* terete, straight, somewhat obtuse, smooth (D. C.)

Tree from twenty to thirty feet high. *Leaves* alternate, pinnate, from twelve to eighteen inches long; *leaflets* from two to six inches long, and from one and a half to three inches broad. *Stipules* minute. *Racemes* one to two feet long. *Flowers* large, bright-yellow, fragrant, on long footstalks. *Legume* cylindrical, ligneous, one to two feet long, externally blackish-brown; with three longitudinal bands or seams extending the whole length, two of which by their contiguity appear to form a single one, the third being on the opposite side of the legume; internally divided into numerous cells by thin, transverse partitions or phragmata, formed by the distension of the placenta, and therefore called spurious dissepiments. *Seed* one in each cell, surrounded by a soft blackish pulp, which appears to be a secretion of the endocarp or inner coat of the pod.

Hab.—East Indies, Egypt. Introduced into the West Indies.

Description.—The pods of Cassia Fistula (*cassia fistula; legumen cassiæ fistulæ*) are imported from the East Indies (Madras and Ceylon), from the West Indies (Barbadoes), and from South America (Carthagena and Savanilla). Their botanical description has been above given. Their *pulp* (*pulpa cassiæ fistulæ; pulpa leguminis cassiæ fistulæ*) is reddish-black, with a sweetish taste. By exposure to the air it becomes acid, in consequence of undergoing the acetous fermentation. Those pods yield the most pulp which are heavy, and do not rattle when shaken.

Cassia pulp is directed by the *London College* to be prepared as follows:—"Pour boiling water upon the bruised Pods of Cassia, that the pulp may be washed out, which press first through a coarse sieve, and afterwards through a hair one; then evaporate the water in a water-bath, until the pulp acquire a proper consistence."

Small American Cassia Fistula. Petite Casse d'Amérique, Guibourt.—*Pods* twelve to eighteen inches long, and six lines in diameter, pointed at the extremities. *Pericarp* thinner than the ordinary Cassia fistula. *Pulp* reddish-brown, acerb, astringent, sweet. Is this pod the fruit of *Cathartocarpus bacillaris*, a native of the Caribæan Islands, depicted in Jacquin's *Fragm. Bot.* Tab. 85?

The pulp of *Cassia brasiliana* has been employed in America. The pods are from 18 to 24 inches long, ligneous, and rough, with very prominent sutures.

Composition.—Vauquelin (*Ann. Chim.* vi. 275) and N. E. Henry (*Journn. Chim. Méd.* ii. 370) have analyzed Cassia pulp.

Vauquelin's Analysis.

Pericarp		35·15
Phragmata		7·03
Seeds		13·28
Pulp	Sugar	14·85
	Gum	1·56
	Extractive	0·51
	Vegetable jelly	0·13
	Glutinous matter	0·79
	Woody fibre	2·35
	Water	21·35
Cassia pods		97·00

N. E. Henry's Analysis.

	Common or African.	*American.*
Sugar	61·00	69·25
Gum	6·75	2·60
Matter possessing many properties of tanning substances	13·25	3·90
Do. having some properties of gluten	traces	traces
Colouring matter soluble in ether	small quan^y	none
Loss, principally owing to water	19·00	24·25
Watery extract of Cassia pulp	100·00	100·00

Physiological Effects.—Cassia pulp in small doses is a mild laxative, in larger ones a purgative; but it is apt to occasion nausea, flatulence, and griping. Manna is said singularly to exalt the purgative effect of Cassia pulp (see Paris, *Pharm.* i. 271, 6th ed.) Thus Valisnieri states that twelve drachms of this pulp are about equivalent in purgative strength to four ounces of manna; but that if we give eight drachms of Cassia pulp, in combination with four drachms of manna, we obtain double the effect! But the correctness of such an incredible statement is not to be admitted on any evidence yet adduced in support of it.

Uses.—It is rarely or never given alone; but the cases for which it is well adapted are febrile and inflammatory affections. On account of its pleasant taste it would be a convenient purgative for children.

Administration.—Dose, for an adult, of the pulp, as a mild laxative, ʒj. to ʒij.; as a purgative, ℥j. to ʒij.

Confectio Cassiæ, L. *Electuarium Cassiæ*, D.—(Cassia pulp [recently expressed, *D.*] lb. ss.; Manna, ℥ij.; Tamarind pulp, ℥j.; Syrup of Rose, f℥viij. [Syrup of Orange Peel, lb. ss. *D.*] Bruise the Manna, then dissolve it in the Syrup; afterwards mix in the Cassia and Tamarind pulps, and evaporate the moisture until a proper consistence is attained).—Laxative. Occasionally used for children, or as a vehicle for some more active substance. Dose, ʒij. to ℥j. for adults.

Copaif'era, Linn.—*Various Species*, E.

Copaif'era Langsdor'fii, *Decandolle, L.*—Copaif'era officina'lis, *Linn. D.*

Sex. Syst. Decandria, Monogynia.

(Resina liquida, *L. D.*—Fluid resinous exudation, *E.*)

History.—The first notice of Copaiva balsam, as well as of the tree yielding it, was given by Piso (*Med. Bras.* lib. iv. cap. 4, in *Hist. Nat. Bras.* Lugd. 1648). Hayne (Duncan, *Suppl. to the Edinb. New Disp.* p. 45) is of opinion that the *Copaifera bijuga* is the species observed by Piso.

Botany. *Gen. Char.*—*Calyx* ebracteolate, of four spreading, small equal sepals united at the base. *Petals* none. *Stamens* ten distinct, nearly equal; *anthers* oblong. *Style* filiform. *Legume* stalked, obliquely elliptical, coriaceous, somewhat compressed, two-valved, with two ovules, one-seeded. *Seed* elliptical, inclosed in a baccate aril. *Embryo* straight; *radicle* somewhat lateral.—*Trees.* *Leaves* abruptly pinnate. *Leaflets* coriaceous, somewhat unequal, ovate. *Flowers* paniculate (D. C.)

Species.—1. C. multijuga, Hayne.—*Leaflets* six to ten pairs, ovate-lanceolate, acuminate, mucronate, with pellucid dots. *Petiole* slightly hairy.—In the province of Para the greatest quantity of the balsam is furnished by this species (Hayne).

2. C. Langsdorfii, Desf. *L.*—*Leaflets* three to five pairs, ovate or oval, blunt, equal-sided, with pellucid dots. *Petioles* and *peduncles* slightly downy.—This and the following species furnish the balsam collected by the natives of Santa Paulo.

3. C. coriacea, Mart.—*Leaflets* two to three pairs, elliptical, equal-sided, emarginate, coriaceous, not dotted, reticulated, smooth on both sides, somewhat glaucous beneath. *Petioles* and *peduncles* almost smooth.—Bahia—It yields balsam of copaiva in Santa Paulo.

4. C. officinalis, Linn. D.; *C. Jacquini*, Desf.—*Leaflets* two to five pairs, incurved, ovate, unequal-sided, obtusely acuminate, with pellucid dots.—Venezuela, near Calaboso, West Indies.—An inferior kind of balsam is said to be obtained from this species.

The following are species of Copaifera described by Hayne:—

5. C. Beyrichii, Hayne.—Mandiocca, in the Brazils.
6. C. guianensis, Desf.—Guiana, near Rio Negro.
7. C. Martii, Hayne.—Para.
8. C. bijuga, Willd.—Brazils.
9. C. Jussieui, Hayne.—Brazils.
10. C. nitida, Mart.—Brazils (Minas Geraes).
11. C. laxa, Hayne.—Brazils.
12. C. cordifolia, Hayne.—Brazils.
13. C. Sellowii, Hayne.—Brazils.
14. C. oblongifolia, Mart.—Brazils (Minas Geraes).

Extraction of the Balsam.—The balsam is obtained by making incisions into the stems of the trees. It exudes so abundantly that, at the proper season, twelve pounds are sometimes obtained in the space of three hours (Piso, *op. supra cit.* p. 56). If, however, no balsam should flow, the wound is immediately closed with wax or clay, and re-opened in a fortnight, when an abundant discharge takes place. Old trees sometimes furnish balsam two or three times in the year.

Commerce.—Balsam of Copaiva is principally obtained from Para and Maranham. This probably is yielded, for the most part, by *C. multijuga*. Carthagena, Maracaibo, and Savanilla, also furnish some. Is this from *C. officinalis?* Occasionally it is brought from Rio Janeiro, and is there probably procured from *C. Langsdorfii* and *coriacea*. Now and then some comes from the West Indies. But a considerable quantity is imported, at second hand, from New York. It is usually brought over in casks holding one cwt. or one and a half cwts. In 1839 duty (4s. per cwt.) was paid on 643 cwts.

Description.—Balsam of Copaiva (*balsamum copaivæ* seu *copaibæ*) is a clear, transparent liquid, having for the most part the consistence of olive oil. It has a pale yellowish colour, a peculiar, not disagreeable odour, and a bitter somewhat acrid and nauseous taste. Its sp. gr. is less than that of water, but is not constant. It is 0·95 according to Schönberg, while Stoltze says it is 0·966. By keeping it becomes considerably denser. Balsam of copaiva is insoluble in water, but is completely soluble in alcohol, ether, and the oils, both fixed and volatile. When acted on by alkalies it yields a kind of soap, which is insoluble in water.

Considerable variation exists in the colour, consistence, and sp. gr. of, as well as in the relative quantities of volatile oil and resin yielded by, balsam of copaiva. Even the odour and taste vary somewhat. The differences doubtless depend in great part upon the balsam being procured from different species. The smaller species, which grow in the interior of the Brazils, as in Bahia and Minas, yield, as we are told, less balsam but it is more resinous and sharper. *Brazilian Copaiva* is thin, clear, and pale-coloured. *West Indian Copaiva* (produced probably by *C. officinalis*) is thick, golden-yellow, not transparent, and has a less agreeable smell, which is somewhat like that of turpentine.

Adulteration.—There is no reason to suppose that balsam of copaiva is adulterated in this country now; though the fact mentioned by Dr. Paris (*Pharmacologia*, ii. 183, 6th ed.) proves that formerly it was. "A curious trial took place some time since, between the owners of certain premises that were burnt down, and the Governors of the Sun Fire-Office, in consequence of the latter refusing to indemnify the proprietor for his loss, because the fire had been occasioned by his *making* Balsam of Copaiba."—Gray (*Suppl. to the Pharm.*) has published formulæ for making a *balsamum copaibæ reductum*, as well as *copaiba factitia.*—The *Edinburgh College* gives the following characters of its purity:—

"Transparent: free of turpentine odour when heated: soluble in two parts of alcohol: it dissolves a fourth of its weight of carbonate of magnesia, with the aid of a gentle heat, and continues translucent."

The turpentine odour may be recognized by dropping the suspected balsam on a heated iron (as a spatula).—The mixture of magnesia and copaiva here referred to, acquires, in several hours, the translucency, aspect, and consistency of very thick mucilage of gum arabic. This test is due to Blondeau (*Journ. de Chim. Méd.* i. 560: and ii. 41).—If one or two drops of suspected balsam be placed on unsized paper, and carefully heated over a lamp to expel the volatile oil, an homogeneous translucid spot is left, if the balsam be pure, but if it have been mixed with castor oil, the spot of resin is surrounded by an oily areola (Chevallier, *Journ. de Chim. Méd.* t. iv. p. 619). Planche (*Journ. de Pharm.* xi. 228) has recommended ammonia as a test. If pure balsam be shaken with liquor ammoniæ (sp. gr. 0·965) it becomes clear and transparent in a few instants; not so when castor oil is present. Ebullition with water (to expel the volatile oil and obtain the hard resin);—and the action of potash, and of sulphuric acid, have also been proposed as tests.

Composition.—F. Hoffmann (*Obs. Phys. Chym.* lib. i. obs. vi. *Op. omn.* t. iv. p. 454. Gen. 1748) submitted copaiva to a chemical examination. Afterwards Schönberg (Pfaff, *Mat. Med.* iv. 12) analysed it. In 1826 Stoltze (*Berl. Jahrb.* xxvii. 2, 179), and, in 1829, Gerber (*Journ. de Pharm.* xvi. 79 and 367) submitted it to analysis.

	Stoltze's Analysis.	Gerber's Analysis. Fresh Balsam	Old Balsam
Volatile oil	38·00	41	31·70
Yellow hard resin (*copaivic acid*)	52·75	51·38	53·68
Brown soft resin	1·66	2·18	11·15
Water and loss	7·59	5·44	4·10
Balsam of Copaiva	100·00	100·00	100·63

As copaiva does not contain benzoic acid, it cannot be correctly termed a balsam, according to the modern definition of this word (see p. 74).

1. *Volatile Oil of Copaiva* (*Oleum Copaibæ*).—Obtained by submitting the balsam to distillation with water in the ordinary still. The quantity of oil procured varies somewhat with different samples of balsam, but the average produce, I am informed, is 40 to 45 per cent. Ader (*Journ. de Pharm.* xv. 95) has published a method for procuring the oil without distillation; but the process is more expensive, while the oil obtained by it is impure, owing to the presence of a little resinous soap.

When oil of copaiva has been rectified, and afterwards freed from water by digesting it on chloride of calcium, it has a specific gravity of 0·878. It is colourless, and has an acrid taste, and an aromatic peculiar odour. Sulphuret of carbon and sulphuric ether dissolve it in all proportions; absolute alcohol dissolves two-fifths its weight of it; ordinary rectified spirit takes up less than this. Potassium may be preserved in it unchanged, showing the absence of oxygen. It dissolves sulphur, phosphorus, and iodine (by the latter it is coloured), and absorbs chlorine, with which it becomes turbid and viscid. When dropped on iodine, heat and hydriodic acid are suddenly produced.

Sulphuric and nitric acids convert it into a resinous substance. When hydrochloric acid gas is passed into this oil, crystals of the *hydrochlorate of the oil of copaiva* (or *artificial camphor of the oil of copaiva*) are deposited, while a fuming oily product, saturated with acid, remains. Hence, therefore, it is probable that oil of copaiva, like the oil of turpentine (see p. 710), consists of at least two isomeric oils: one which forms the crystallizable compound with hydrochloric acid; the other, which does not form this crystalline matter.

Oil of copaiva is isomeric with oil of turpentine,—that is, it consists of $C^{10}\ H^{8}$.

2. *Resin of Copaiva* (*Resina Copaibæ*).—After the balsam has been deprived of its volatile oil by distillation, a brownish resinous mass is left behind. This, when gently heated to expel the residual water, is sold as *resin of copaiva*. It consists of two resins —one called *copaivic acid*, the other the *viscid resin of copaiva*. They are separated by rectified spirit, which dissolves the acid resin, but leaves the viscid one.

(*a.*) *Copaivic Acid: Yellow Brittle Resin of Copaiva.*—One hundred parts of balsam yield, on an average, fifty parts of this acid. Copaivic acid is an amber-coloured, brittle, crystallizable resin, soluble in alcohol, rectified spirit, ether, and the volatile and fixed oils. It is decomposed by sulphuric and nitric acids. Its acid properties are proved by its alcoholic solution reddening litmus, and by the definite compounds (*copaivates*) which it forms with bases. Thus, if an alcoholic solution of nitrate of silver be dropped into the alcoholic solution of this resin, we obtain, on the addition of a little ammonia, a white crystalline precipitate (*copaivate of silver*), slightly soluble in alcohol, and composed of one atom copaivic acid, and one atom oxide of silver. In the same way we may form the analogous *copaivates of lead* and *lime*. The *copaivates* of *potash* and *soda* are soluble, and have a bitter taste and a disagreeable odour: they are easily decomposed by acids. The *copaivate of ammonia* is soluble in ether and alcohol, but not in water. The *copaivate of magnesia* is prepared by adding copaivate of potash to sulphate of magnesia.

Copaivic acid is isomeric with pinic acid (see p. 717); that is, its composition is $C^{40}\ H^{32}\ O^{4}$.

(*b.*) *Viscid Resin of Copaiva; Brown Soft Resin of Copaiva.*—When a hot alcoholic solution of copaiva cools, it retains in solution the acid resin already described, but deposits a brown viscid substance, which is termed the *viscid resin of copaiva*. As it is more abundant in old than in recent balsam, Gerber regards it as produced by some alteration of the acid resin. It is soluble in anhydrous alcohol and ether, and in the volatile and fixed oils. It has very little affinity for basic substances. One hundred parts of balsam contain from 1·65 to 2·13 per cent. of this resin.

Physiological Effects.—Copaiva produces the general and topical stimulant effects of the oleo-resins, already described (see p. 73). Taken in *moderate* doses it creates a sensation of warmth in the stomach, gives rise to eructations having the odour of the balsam, and not unfrequently occasions nausea, or even actual vomiting. The continued use of it often impairs the appetite, and disorders the digestive functions. These may be regarded as the local effects on the stomach. The constitutional effects, or those which result from the absorption of the balsam, or of its active constituent, the oil, are those of a stimulant whose influence is principally directed to the secreting organs, more especially to the mucous membranes and to the urino-genital apparatus. The oil passes out of the system in part by the lungs, and the odour of its vapour is readily detectable in the breath of persons taking it. The urine is increased in quantity, and altered in quality: thus its colour is heightened, its odour becomes balsamic, and its taste bitter; moreover, not unfrequently it is turbid, as if containing mucus. The influence of copaiva over the mucous membrane lining the urethra, is shown even in the healthy state, by the warmth and tickling sometimes experienced in this part, both before and after evacuating the urine, as observed by König, a medical student (Wibmer, *Wirk. d. Arzneim. ü. Gifte.* Bd. i. 184), in his experiments with this medicine; and also by the marked influence which the balsam has in mucous discharges from this membrane—an influence familiar to every tyro in medicine. Furthermore, it is said occasionally to have produced unpleasant irritation of the testicles, though I have never observed this. It also acts as a stimulant, but in a less marked manner, to other mucous membranes; namely, the bronchial and gastro-intestinal membranes. The greater influence of copaiva over the urethral than over other mucous membranes is by some explained thus:—Besides the influence which this receives in common with the other membranes of the same class, by the general circulation, it is exposed to the local action of copaiva contained in the urine as this fluid is expelled from the bladder. If this hypothesis were correct, the influence of copaiva over the mucous lining of the bladder would be greater than that over the urethral membrane. Not unfrequently it gives rise to an eruption, usually of a scarlet colour, referrible to either urticaria or erythema, though some describe it as being miliary. Vesicular eruptions are also spoken of, but I have never seen them. Mr. Judd (*Pract. Treat. on Urethritis and Syphilis*, Lond. 1836) has depicted two eruptions caused by the balsam:—one he calls *small puniceous patch eruption;* the other was a *papular eruption.* Rheumatism has also been ascribed to the use of the balsam (*Brit. and For. Med. Rev.* vol. viii. p. 280; and *Lancet*, vol. ii. for 1837-8, p. 826).

Large doses of copaiva irritate the gastro-intestinal canal, and occasion a sensation of heat at the pit of the stomach, nausea, vomiting, loss of appetite, and purging, with, not unfrequently, griping pains of the bowels. The whole system becomes powerfully stimulated, the pulse is fuller and more frequent, the skin hotter, and thirst and headache are produced. Occasionally, hæmaturia and dangerous ischuria are brought on. "I saw," says Kraus (*Heilmittellehre*, 621, Gött. 1831), "a very dangerous case, of thirty-six hours standing, almost instantaneously relieved by the application of a warm poultice (made of four ounces of the hyoscyamus plant) over the genital organs." The same author also says that the repeated use of large doses occasions, "in young marriageable subjects, a measle-like eruption over the whole body, which I have many times seen treated by pretended great diagnosticians (*Diagnostikern*) as true measles."

In one case (*Brit. and For. Med. Rev.* vol. ix. p. 270) pain at the stomach, general uneasiness, and epileptic convulsions, followed, and were ascribed to, the use of copaiva. But the correctness of ascribing the convulsions to the use of the copaiva appears very doubtful.

When we compare the operation of copaiva with that of other agents possessing powers of a somewhat similar kind, we observe that both in local and constitutional effects it is more powerful than the balsams properly so called (that is, the native oleo-resins which contain benzoic acid), while its operation on the urino-genital organs is much more marked (see pp. 74 and 938). It forms an intermediate substance between the balsams and the turpentines, being less powerful, but more aromatic, than the latter: yet, observes Ribes (quoted by Bayle, *Bibl. Thérap.* i. 363), the turpentines are less successful in gonorrhœa. The same author considers it to be less powerful than balsam of Mecca, but more so than balsam of Canada.

Uses.—The principal employment of copaiva is in *mucous discharges from the urino-genital organs*, more especially in gonorrhœa. There are two methods of treating this disease by copaiva: one is, not to exhibit the balsam until the inflammatory symptoms have subsided,—the other is to give it at the very outset, in order to cut short or suppress the disease.

The *first* method is that followed by the best English and German surgeons. It consists in employing, during the violence of the inflammatory stage, antiphlogistic and soothing measures: and when the inflammation has quite or nearly subsided, or is of a very mild character, giving copaiva with the view of diminishing or stopping the discharge. This is the plan recommended by Hunter (*Treat. on the Vener. Dis.*), and the same practice is recommended in the published lectures of Sir Astley Cooper (*Lancet*, vol. iii. p. 199) and Mr. Lawrence (*Lond. Med. Gaz.* vol. v. p. 813). It is undoubtedly the safest method of treatment; for although copaiva may sometimes, or even frequently, be exhibited during the acute or inflammatory stage of gonorrhœa, not only with impunity, but even with advantage, there is no denying the fact that it has, occasionally at least, exasperated the symptoms. This, indeed, is admitted by Ansiaux (*Mém. sur le Traitem. de la Blennorrh.*, quoted by Bayle, *op. supra cit.* p. 348), one of the principal supporters of the other plan of treatment. Many practitioners judge of the propriety of exhibiting the balsam by the quality of the discharge only, and refrain from administering this medicine until the discharge has acquired what is called a gleety character. I believe most prudent surgeons consider the existence of much pain or scalding in passing the water an irritable condition of bladder, or violent chordee, as contra-indicating the use of copaiva; while the absence of these symptoms may be regarded as permitting or indicating it.

The *second* method of treating gonorrhœa by copaiva consists in exhibiting this medicine in large doses at the commencement of the disease; that is, in its acute stage, usually without adopting any preliminary antiphlogistic or soothing measures. In America the practice is not new; but in Europe it has been recommended or adopted to any extent only since the commencement of the present century, and principally by the recommendations of Ansiaux, Ribes, and Delpech (Bayle, *op. supra cit.*)

Ansiaux candidly admits that in some cases the practice has been injurious; in one instance he saw it produce acute pain, irritable bladder, and discharge of blood by the urethra. The second of these writers seems to regard copaiva as a specific for gonorrhœa and all its consequences, including swelled testicle, dysury, ischury, cystitis, nephritis, &c.! Delpech speaks of its use in a much more guarded manner; he employs leeches and the usual antiphlogistic measures, when the inflammatory symptoms are very severe; but when the inflammation is not excessive, he commences at once with the balsam. In fact, his practice approximates very much with that usually followed in this country and Germany. The partisans of this second method of treating gonorrhœa say, that both copaiva and cubebs cure more easily and promptly, and with less chance of relapse, the sooner they are exhibited after the commencement of the disease; in other words, old claps are less readily cured by them than recent ones.

It has been stated by Delpech and Ricord, and I believe the experience of most practitioners bears out their statement, that copaiva is less successful in the gonorrhœa of females than in that of males. Trousseau and Pidoux (*Traité de Thérapeut.* t. i. p. 494) have endeavoured to account for this by saying, that, in the female, gonorrhœa is not confined to the mucous lining of the urethra (on which the influence of copaiva is principally exercised), but extends to that of the vagina.

Velpeau (*Rech. sur l'Emploi du Baume de Copahu*) employs lavements of the balsam in gonorrhœa. By this mode of exhibition the nausea and vomiting which copaiva is apt to occasion, when taken by the mouth, are entirely obviated. Velpeau asserts, that by this mode of administration, blennorrhagic discharges of both males and females are almost always diminished, and frequently completely stopped. He found the same practice useful in non-venereal puriform discharges from other mucous membranes. Indeed, he asserts that copaiva lavements may in all cases be substituted for the administration of this liquid by the mouth.

In *chronic inflammation of the bladder* (commonly termed *cystirrhœa*, or *catarrhus vesicæ*) copaiva has at times been found beneficial (La Roche, *Am. Journ. of the Med. Sciences*, vol. xiv. p. 13). Delpech relates a case of *acute* vesical catarrh cured by it. But catarrhus vesicæ is for the most accompanied with considerable irritation, which is in general greatly increased by stimulants like copaiva.

In *leucorrhœa* copaiva has been employed with some advantage. Favourable reports of this practice have been published by Cuttet and Lacombe (Bayle, *op. supra cit.*), Armstrong (*Pract. Illustr. of the Scarlet Fever*, &c. 1818), and others.

In *chronic pulmonary catarrh* its employment has been spoken favourably of. Armstrong (*op. supra cit.*), Hallé, Bretonneau, and La Roche (quoted by Bayle), have borne testimony to its good effects. It is only adapted for chronic, old-standing cases, and for torpid habits. Its stimulant influence is calculated to be very injurious where there is inflammation or febrile disorder. Dr. Fothergill (*Med. Obs. and Inq.* vol. iv. 231) has very properly reprobated the practice of administering it in pulmonary consumption, as recommended by Fuller and others.

In *chronic inflammation of the mucous membrane of the bowels*, especially of the colon and rectum, copaiva has been used (La Roche, *Lond.*

Med. Gaz. vol. ii. p. 31. N. S.) Dr. Cullen *Mat. Med.*) spoke favourably of its use in *hemorrhoids*. "I have learned from an empirical practitioner," he says, "that it gives relief in hæmorrhoidal affections; and I have frequently employed it with success. For this purpose it is to be given [in doses of] from 20 to 40 drops, properly mixed with powdered sugar, once or twice a day."

It was formerly employed as a *topical application* to wounds and ulcers.

Administration.—Dose, from gtt. xx. to f℈j., or even more. It is sometimes taken on sugar, and this is said to be the most efficacious method of giving it, in affections of the urinary organs; but its nauseous taste is a great objection to its employment in this way. Some take it *swimming on half a wine-glassful of water*, to which a few drops of some bitter tincture have been added. Many persons employ it in the form of *emulsion* (made with mucilage, yolk of egg, or alkalies). If mucilage be employed, it should not be very thick, otherwise it will not mix well. Spirit of nitric ether is frequently added to cover the unpleasant flavour. Opium is sometimes conjoined to counteract purging, and acids (especially the sulphuric) to check nausea. *Syrup of copaiva* (prepared by rubbing ℥iv. of balsam with 32 grs. of calcined magnesia, and then adding 64 drops of oil of peppermint and 62 ozs. of simple syrup) has been recommended (*Lond. Med. Gaz.* vol. ii. p. 864. N. S.) Balsam of copaiva has also been taken in the form of *pills*; various powders (starch, gum, rhubarb, magnesia, &c.) being employed to give it a proper consistence. If magnesia be employed (as recommended by Mialhe), the copaivic acid unites with it, and thereby forms copaivate of magnesia, which has considerable consistence, and absorbs the volatile oil. In some cases the balsam acquires, by magnesia, a pilular consistence, but frequently it does not become thicker than honey. Bordeaux turpentine also possesses this property of solidifying with magnesia (see p. 706). The following is a formula for *copaiva pills* (Soubeiran, *Traité de Pharm.* i. 523):—Balsam of Copaiva, ℥j.; Calcined Magnesia, ℈vj. or ℨvij. (or common Carbonate of Magnesia, ℥j.) Several hours are frequently required to effect the solidification of the balsam.—Velpeau's *copaiva lavement* is thus prepared:—Balsam of Copaiva, ℈ij.; Yolk of one Egg; Distilled Water, f℥viij. Make an emulsion, and to which add Tincture of Opium, gtt. xx. or gtt. xxx.—*Gelatine capsules of balsam of copaiva* (small olive-shaped gelatinous capsules, each containing about ten grains of balsam) are now common in the shops. They have been introduced with the view of avoiding the nauseous odour and taste of the balsam. When swallowed the gelatinous capsule dissolves in the gastro-intestinal juices, and allows the balsam to escape. Ratier (*Dict. prat. de Méd.* t. xv. 288) has proposed to introduce them into the rectum. For this purpose they are to be conveniently greased. These capsules were the invention of a Frenchman of the name of Mothe. They are now manufactured in London by Mr. Wildenow, whose agent informs me that the capsules are made of a compound of gelatine, gum, and sugar. In very hot weather some difficulty is experienced in making them. Desfontenelles (*Journ. de Chim. Méd.* t. vi. p. 103, 2nd. Sér., and *Lancet*, March 7, 1840) has described a method of making the capsules. It consists in coating the distended and greased swimming bladder of the tench (or other small fish) with gelatine, and afterwards withdrawing the air and the membranous mould.

Manufacturers, however, must have some cheaper and more readily procurable mould than a fish's swimming bladder. *Gelatinous capsules of cubebs*, containing the oil of cubebs, are also prepared by Mr. Wildenow.

The resin of copaiva, which was much extolled a few years since (Thorn, *Observ. on the Treatm. of Gonorrh. by a new Prep. from the Bals. of Copaiba*, 1827), is the least active part of the balsam.

Oleum Copaibæ, E. (Copaiva, ℥j.; Water, Oiss. Distil, preserving the water; when most of the water has passed over, heat it, return it into the still, and resume the distillation; repeat this process so long as a sensible quantity of oil passes over with the water). The directions of the *Edinburgh College* make the process of obtaining the oil appear a more operose one than it really is. Mr. Whipple informs me, that from 249 lbs. of balsam he obtained 128 lbs. of volatile oil and 120 lbs. of resin. — The physical and chemical properties of the oil have been already described (p. 1175).—I prefer the oil of copaiva to any other preparation of the balsam. The usual dose is from ten to twenty drops, which may be gradually increased; but I have known f℥ij. taken at one dose without any ill effects. It may be taken on a lump of sugar.

Other Medicinal Leguminosæ.

Fig. 218.

Spartium junceum.

Spar'tium jun'ceum or *Spanish broom*, the σπαρτιον of Dioscorides, is occasionally employed in medicine. The seeds, in large doses, are emetic and purgative; in small quantities, diuretic. They have been employed by Dr. Eccles (Pearson, *Observ. on Broomseed*, 1835, Lond.) in dropsical affections. Their advantage over other diuretics is their tonic operation, in consequence of which they may be persisted in for an indefinite length of time (Pearson). They may be taken, in the form of *powder*, in doses from grs. x. to grs. xv., three times a-day, in cold ginger-tea or mint-water; but the *tincture* (prepared by digesting ℥ij. of the bruised seeds in f℥viij. of proof spirit) is the best form of exhibition. Its dose is f℈j. to f℈iij.

Fig. 219.

Butea frondosa.

The *Bu'tea frondo'sa* is a middling-sized tree, common in Bengal and in the mountainous parts of India. "From natural fissures and wounds made in the bark of this tree, during the hot season, there issues a most beautiful red juice, which soon hardens into a ruby-coloured, brittle, astringent gum" (Roxburgh, *Fl. India*, vol. iii. p. 245). This is *gum butea*. It has been recently brought over by Mr. Beckett, by whom samples were given to Dr. Royle (*Proceedings of the Committee of Comm. and Agricult. of Royal Asiatic Soc.* 1838, p. 50, Lond.) On examination, I found this gum to be identical with a substance which I had previously met with in an old drug firm of this city, marked *gummi rubrum astringens*, and samples of which I had sent to Professor Guibourt, who has described it under the name of *gomme astringente de Gambie* (*Hist. des Drog.* ii. 428, 3me éd.), believing it to be the kind described by Fothergill (*Med. Obs. and Inq.* i. 358, 4th ed.), but which I have already expressed my opinion that it is not (see p. 1143). Butea gum (called *Kuenee* in Northern India, and *Kin-suka* in Sanscrit) is in small elongated tears, which are blackish externally, and have pieces of bark adhering to them. Small fragments examined by transmitted light, are observed to be ruby-red. Its taste is astringent. It contains from 15 to 25 per cent. of impurities (wood, bark, small pebbles, and sand). According to Mr. E. Solly, the gum, when purified by simple solution of water, so as to separate the impurities, consists of *tannin* 73·26, *difficultly soluble extractive* 5·05, *gum* (with *gallic acid* and *other soluble substances*) 21·67. It is used by the natives of North-Western India, for precipitating their indigo, and in tanning.

Indigo (*pigmentum indicum; ινδικον*, Dioscorides; *indicum*, Pliny) is a blue pigment obtainable from various plants by fermentation. The ancients also applied the term *ινδικον*, or *indicum*, to some other substances (Beckmann, *Hist. of Inv. and Discov.* iv. 118). The indigo of commerce is procured from the genus *Indigofera*. In India, *I. tincto'ria* is commonly cultivated for this purpose. During the fermentation, the indigo deposits as a feculent matter. Lime-water promotes its separation. Blue indigo does not exist in the plants previous to fermentation: it is, therefore, a product, not an educt, of them. Commercial indigo is principally brought from the East Indies, but a considerable quantity is imported from Guatemala, and other places. It usually occurs in cubical cakes of an intense blue colour. Rubbed with a smooth hard body (as the nail), it assumes a coppery or bronze hue. This distinguishes it from Prussian blue, the coppery hue of which is removed by friction with the nail. It is insoluble in water, cold alcohol, ether, diluted sulphuric or hydrochloric acids, weak alkaline solutions, and cold oils (both fixed and volatile). When heated to about 550° F. it evolves a reddish violet vapour (vapour of *indigotin*) which condenses in minute crystals. Deoxidizing agents (as protosulphate of iron, sesquisulphuret of arsenicum, the process of fermentation, &c.) destroy its blue colour by abstracting oxygen from the indigotin, and converting it into *indigogen;* which, by exposure to the air, attracts oxygen, and becomes blue. Chlorine and the hypochlorites destroy the blue colour of indigo. Rubbed with oil of vitriol it yields a deep blue liquid, commonly termed *sulphate of indigo*, *Saxon blue*, or *liquid blue*. Commercial indigo consists of *indigo-blue* (indigotin), *indigo-brown*, *indigo-red*, and *a glutinous substance*. Indigotin consists, according to Dumas, of $C^{15}\ H^5\ N^1\ O^2$. Indigo has, of late years, been employed as a medicine. Its physiological effects, according to Dr. Roth (*Diss. Inaug. de Indico*, 1834, Berol., and *Brit. and For. Med. Rev.* vol. ii. p. 244), are as follows:—Shortly after taking it, the patient experiences a sense of constriction at the fauces, and the impression of a metallic taste on the tongue. These are followed by nausea, and frequently by actual vomiting. The intensity of these symptoms varies in different cases. In some the vomiting is so violent as to preclude the further use of the remedy. The matter vomited presents no peculiarity except in its blue colour. When the vomiting has subsided, diarrhœa usually occurs: the stools are more frequent, liquid, and of a blue or blackish colour. The vomiting and diarrhœa are frequently accompanied by cardialgia and colic. Occasionally these symptoms increase, and the use of the remedy is in consequence obliged to be omitted. Dyspepsia and giddiness sometimes succeed. The urine has a brown, dark, violet colour; but Dr. Roth never found the respiratory matter tinged with it. After the use of indigo for a few weeks, twitching of the muscles sometimes were observed, as after the use of strychnia. It has been employed principally in spasmodic affections—viz. epilepsy, convulsions of children, chorea, and hysteria. In epilepsy it has been tried by Von Stahly, Lenhossek, Grossheim, Ideler, Wolf, Leineweber, Dœpp (Roth, *op. cit.;* Dierbach, *Neuest. Entd. in d. Mat. Med.* Bd. 1, S. 222, 1837), and Noble (*Lond Med. Gaz.* vol. xvii. p. 1038), with good effect. Some of the successful cases were of very long standing. Roth says, that at the commencement of the treatment, the frequency of the paroxysms was invariably increased. Idiopathic epilepsy is said to have been more benefited by it than the symptomatic epilepsy. The dose of indigo should be as large as the stomach can bear. At the beginning it may be a few grains; afterwards this quantity should be increased to drachms, or even an ounce or more in the day. Some of the patients above referred to, took from ℥ss. to ℥j. daily, for three or more months. The best mode of exhibiting it is in the form of an electuary, composed of one part of indigo and two parts of syrup, with a small portion of water. The powder is apt to cause spasm of the fauces. Aromatics, mild tonics, astringents, and opiates (as the *compound powder of ipecacuanha*), may be conjoined, according to circumstances.

Fig. 220.

Indigofera tinctoria.

ORDER 59. TEREBINTHACEÆ, *Jussieu.*—THE TEREBINTH TRIBE.

BURSERACEÆ, XANTHOXYLACEÆ, CANNARACEÆ, AMYRIDACEÆ and ANACARDIACEÆ, *Lindley.*

ESSENTIAL CHARACTERS.—*Flowers* hermaphrodite, polygamous, or diœcious. *Sepals* three to five, more or less united at the base, imbricated in æstivation, very rarely adherent to the ovary. *Petals* rarely none, generally distinct, as many as, and alternate with, the sepals, very seldom united at the base; imbricated or valvate in æstivation. *Stamens*, as well as the petals, arising from the lower part of the calyx, or from the calycine disk, rarely from the torus surrounding the ovary; either equal in number to, and alternate with, the petals, or double (very rarely quadruple) the number of the petals, and then placed alternately before and between the petals. *Carpels*, in some, numerous, distinct, with one style,—in others many, united by the ovaries; in either case some of them are frequently abortive, and hence the carpels in many appear solitary, one-celled, but the number of the styles and stigmas then usually indicates abortion. *Fruit* capsular or drupaceous. *Seeds* few, usually solitary, commonly exalbuminous. *Embryo* straight, curved, arched, or folded back; *cotyledons* various; *radicle* usually superior (D. C.)

PROPERTIES.—The principles common to all the Terebinthaceæ, are:—1st. *Fixed oil* in the seeds; 2ndly. *Volatile oil combined with resin* in the turpentine of the pistacias; 3rdly. *Resin* which flows either naturally, or from artificial openings in the stems of many of the species; 4thly. *Gum usually combined with resin*—as in olibanum, myrrh, tacamahaca, &c. (Fée, *Cours d'Hist. Nat.* i. 619).

Pista'cia Terebin'thus, Linn. L. E. D.—*The Turpentine Pistacia.*

Sex. Syst. Diœcia, Pentandria.

(Resina liquida, *L.*—Liquid resinous exudation, *E.*)

HISTORY.—This tree is the Τέρμινθος or Τερέβινθος of the Greeks. Hippocrates employed the fruits, the buds, and the resin medicinally.

BOTANY. *GEN. CHAR.*—*Flowers* diœcious, apetalous. *Males: Racemes* amentaceous, with one-flowered scales [bracts]. *Calyx* five-cleft. *Stamens* five; *anthers* almost sessile, four-cornered. *Females: Racemes* more lax. *Calyx* three- or four-cleft. *Ovary* one- to three-celled. *Stigmas* three, rather thick. *Drupe* dry, ovate, with a somewhat osseous nut, usually one-celled, one-seeded, sometimes bearing two abortive cells at the side. *Seeds* solitary in the cells, affixed to the side of the cell, exalbuminous. *Cotyledons* thick, fleshy, oily, with a superior lateral radicle.—*Trees* with pinnate leaves (*D. C.*)

SP. CHAR.—*Leaves* pinnate, with an odd one; *leaflets* about seven, ovate-lanceolate, rounded at the base, acute, mucronate (*D. C.*)

FIG. 221.

Pistacia Terebinthus (the female plant).

A *tree* of thirty or thirty-five feet in height. Young *leaves* reddish, old ones dark-green. *Racemes* compound. *Fruit* almost round, purplish.

HAB.—Syria and the Greek Archipelago.

EXTRACTION.—Tournefort (*Voyage into the Levant*, vol. ii. p. 62, Lond. 1741) says, that the turpentine harvest in Scio is made, from the end of July to October, by cutting crosswise with a hatchet the trunks of the largest turpentine trees. The turpentine runs down on flat stones placed under the trees, where it hardens. The quantity yielded by each tree is small, not exceeding eight or ten ounces.

PROPERTIES.—Chian or Cyprus turpentine (*Terebinthina Chia* seu *Cypria*) has the general properties of the coniferous turpentines already described (see p. 705). Its consistency is that of honey, but more glutinous. Its colour is greenish-yellow. It has an agreeable turpentine-like odour combined with the odour of fennel, or, according to some, of citron and jasmine. Its taste is very mild. By keeping it resinifies, and acquires a somewhat less agreeable odour. Genuine Chian turpentine is scarce; the coniferous turpentines being usually sold for it.

COMPOSITION.—I am unacquainted with any analysis of it; but its composition is doubtless similar to the coniferous turpentines.

PHYSIOLOGICAL EFFECTS, USES, AND ADMINISTRATION.—Exactly similar to the other coniferous turpentines (see p. 708).

Pista'cia Lentis'cus, Linn. L. E. D.—*The Mastic* or *Lentisk Tree.*

Sex. Syst. Diœcia, Pentandria.

(Resina, *L. D.*—Concrete resinous exudation, *E.*)

HISTORY.—This tree is the Σχῖνος of the Greeks. Hippocrates employed the leaves, the resin (*mastic*), and the oil prepared from the fruit, in medicine.

BOTANY. *GEN. CHAR.*—See PISTACIA TEREBINTHUS.

FIG. 222.

Pistacia Lentiscus.
a. The male plant.
b. The female plant.

SP. CHAR.—*Leaves* abruptly pinnate; *leaflets* about eight, lanceolate. *Petiole* winged, D. C.—A mere *bush.* *Leaves* evergreen. *Flowers* very small. In *var. β. angustifolia* the leaflets are somewhat linear: in *var. γ. Chia* they are ovate.

HAB.—South of Europe, North of Africa, Levant.

EXTRACTION.—Tournefort (*Voyage into the Levant*, vol. ii. p. 60, Lond. 1741) says, that in Scio the extraction of mastic commences on the first of August. The bark is cut crosswise with huge knives. The mastic exudes and hardens partly on the stem, partly on the ground. The same incisions furnish mastic towards the end of September, but in lesser quantities. The mastic which concretes on the stem is called *mastic in the tear,* while that which falls to the earth constitutes *common mastic.*

PROPERTIES.—Mastic (*mastiche*) occurs in small spherical, flattened, or irregular, pale-yellow tears, which are externally farinaceous, owing to their mutual attrition. Their fracture is vitreous. They have a mild, agreeable odour, and an aromatic taste.

COMPOSITION.—Mastic consists of a minute portion of *volatile oil,* about 90 per cent. of *resin* soluble in alcohol, and 10 per cent. of a resinous substance (*masticine*) insoluble in alcohol.

1. *Masticine,* or that resinous portion of mastic which is insoluble in alcohol, is tenacious, ductile, soluble in ether and oil of turpentine. To this principle mastic owes its peculiar toughness.

2. *Mastic resin,* according to Unverdorben, possesses acid properties similar to those of common rosin (see p. 717).

Physiological Effects.—Analogous to rosin and the turpentines (see pp. 708 and 717).

Uses.—Mastic is rarely employed as a medicine. It has been used to check excessive discharges from the mucous membranes, as leucorrhœa, gleet, chronic pulmonary catarrh, old diarrhœas, &c. Dentists occasionally employ it for filling up the cavities of carious teeth. The Turkish ladies chew it to sweeten the breath, and preserve the teeth and gums. Dissolved in alcohol it forms a very useful cement and varnish. A solution of it in oil of turpentine is a common varnish.

Administration.—It is exhibited as an adjunct only to other medicines. It is a constituent of the *dinner pills* (composed of aloes, ℥vj.; mastic and red roses, āā ℥ij.; syrup of wormwood, q. s.), as which it serves to divide the particles of the aloes. It is a constituent of the *tinctura ammoniæ composita*, Ph. L.; formerly called *eau de luce* or *spiritus ammoniæ succinatus*, which I have before (p. 234) referred to, but the formula of which I omitted to give.

Tinctura Ammoniæ composita, L. *Spiritus Ammoniæ succinatus. Eau de Luce.* (Mastic, ℥ij.*; Rectified Spirit, f℥ix.; Oil of Lavender, ♏xiv.; Oil of Amber, ♏iv.; stronger Solution of Ammonia, Oj. Macerate the Mastic in the Spirit, that it may be dissolved, and pour off the clear tincture; then add the other ingredients, and shake them all together).—Milky, owing to the separation of the mastic from its spirituous solution by the ammonia.—Stimulant and antispasmodic (see p. 234). Dose, gtt. x. to gtt. xxx.

Rhus Toxicoden'dron, Linn. L. D.—*Trailing Poison-oak* or *Sumach.*

Sex. Syst. Pentandria, Trigynia.

(Folia, *L. D.*)

History.—The attention of medical practitioners of this country was first drawn to the medical properties of this plant, in 1793, by Dr. Alderson, of Hull (*Essay on Rhus Toxicodend.* 3rd ed. 1804). It was first described by Cornutus, in his *Plant. Canad. Hist.* Paris, 1635 (Busse, *Diss. Inaug. de Rhoe Toxicod.* Berol. 1811, p. 10).

Botany. *Gen. Char.*—*Calyx* small, five-partite, persistent. *Petals* five, ovate, spreading. *Stamens* five, all fertile in the male and hermaphrodite flowers. *Ovary* one, somewhat globose, one-celled. *Styles* short, three, or *stigmas* three sessile. *Drupe* almost juiceless, one-celled; nut bony, perhaps by abortion one-seeded, and sometimes two- or three-seeded. *Seed* exalbuminous, invested by the funiculus arising from the base of the nut; *cotyledons* foliaceous; *radicle* incumbent on the upper edge of the cotyledons (D. C.)

Sp. Char.—*Leaves* pinnate with an odd leaflet, trifoliate; *leaflets* angularly incised, pubescent (D. C.)

Shrub, one to three feet high. *Stems* many, branching, covered with a brown bark. *Flowers* greenish-white. *Fruit* a round drupe, about as large as a pea.—*Juice* acrid, milky, becoming black by exposure to the air, and forming an indelible ink when applied to cotton or linen.

* By a typographical error in the Pharmacopœia, *ounces* are substituted for *drachms*.

Rhus Toxicodendron is considered by some botanists as a variety only of *Rhus radicans*. I have followed Nuttall and Decandolle in considering it a distinct species.

Hab.—United States of America.

Composition.—I am not acquainted with any detailed analysis of this plant. There are at least two substances in it worthy of investigation;—viz. *the volatile, acrid* (*narcotico-acrid?*) *principle*, and *the substance which blackens by exposure to the air. Tannic* and *gallic acids* are said to be constituents of it.

Physiological Effects. 1. *Of the Emanations.*—When not exposed to the sun's rays, as when it grows in shady places, and during the night, this plant evolves a hydrocarburetted gas, mixed with an acrid vapour, which acts most powerfully on certain individuals exposed to its influence, and produces violent itching, redness, and erysipelatous swelling of the face, hands, or other parts, which have been subjected to its operation; these effects are followed by vesications, and desquamation of the cuticle. In some cases the swelling of the face has been so great as to have almost obliterated the features; but all persons are not equally susceptible of its poisonous operation; so that some peculiar condition of the cutaneous organ seems necessary for the effect to be produced (Orfila, *Toxicol. Gén.*)

2. *Of the Plant.* (*a.*) *On animals.*—Orfila made several experiments with the watery extract of the *Rhus radicans* (whose operation is probably quite similar to that of *R. Toxicodendron*), and concludes that "internally administered, or applied to the cellular texture, it produces a local irritation, followed by an inflammation more or less intense, and that it exerts a stupefying action on the nervous system after being absorbed." Lavina gave a few drops of the milky juice of Rhus Toxicodendron to guinea-pigs and birds, who were at first stupefied by it, but gradually recovered, without any other deleterious effect.

(*b.*) *On man.*– In the human subject *small doses* of the leaves increase the secretions of the skin and kidneys, act slightly on the bowels, and, in paralysed persons, are said to have produced a return of sensibility and of mobility, with a feeling of burning and prickling, with twitchings, in the paralysed parts. *Large doses* occasion pain in the stomach, nausea, vomiting, giddiness, stupefaction, and an inflammatory swelling of the paralysed parts. These effects show that the poison-oak possesses a twofold operation, of an acrid and narcotic.

Uses.—It has been employed in old paralytic cases depending on a torpid condition of the nerves. It has also been given in chronic rheumatism, obstinate eruptive disorders, in some cases of amaurosis, and other nervous affections of the eyes.

Administration.—The *powder* of the leaves is given in doses of from half a grain or a grain, gradually increased until some obvious effect is produced.

Boswel'lia thurif'era, Colebrooke.—*Olibanum-Tree.*

Boswel'lia serrata, *L. D.*

Sex. Syst. Decandria, Monogynia.

(Gummi-resina, *L. D.*)

History.—Olibanum was the frankincense used by the ancients in their religious ceremonies. It is the *Lebonah* of the Hebrews, the *Lubán* of the Arabs; from either of which terms the Greeks, probably, derived their names for it, Λίβανος, Λιβανωτὸς (Colebrooke, *Asiat. Research.* ix. 377). The earliest notice of it is by Moses (*Exod.* xxx. 34). Dioscorides (lib. i. cap. 81) calls it Λίβανος.

Botany.—*Flowers* bisexual. *Calyx* small, five-toothed, persistent. *Petals* five, obovate-oblong, very patent, acute at the base, inserted under the margin of the disk; æstivation very slightly imbricative. *Stamens* ten, inserted under the disk, alternately shorter; *filaments* subulate, persistent; *anthers* caducous. *Torus* a cup-shaped disk, fleshy, larger than the calyx, crenulated on the margin. *Ovary* oblong, sessile; *style* one, the length of the stamens, caducous; *stigma* capitate, three-lobed. *Fruit* capsular, three-angled, three-celled, three-valved, septicidal: valves hard. *Seeds* solitary in each cell, surrounded by a broad membranaceous wing. *Cotyledons* intricately folded, multifid.—*Trees* producing balsam and resin. *Leaves* deciduous, alternate towards the top of the branches, unequally pinnated; *leaflets* opposite, serrated. *Stipules* none. *Racemes* terminal or axillary. *Flowers* on short pedicels, white (Wight and Arnott.)

Sp. Char.—*Leaflets* oblong, obtuse, serrated, pubescent. *Racemes* axillary, single, shorter than the leaves (Wight and Arnott).

Hab.—Mountainous parts of Coromandel.

Description.—*Olibanum, Indian Olibanum,* or *Olibanum of the Boswellia serrata* (*gummi-resina Olibanum; gummi Olibanum; Olibanum indicum* seu *ostindicum*) is imported from India in chests. It consists of round, oblong, or ovate pale-yellowish, semi-opaque, fragile tears, having a balsamic resinous odour.

The substance called on the continent *African* or *Arabian Olibanum* (*Olibanum arabicum*) is rarely met with in this country. It consists of smaller tears than those of the Indian variety. They are yellowish or reddish, and intermixed with crystals of carbonate of lime. Some have supposed it to be the produce of a *Juniperus*,—some of an *Amyris*,—others of *Boswellia glabra*, which Roxburgh says yields a substance used as an incense and a pitch in India.

Composition.—Olibanum (Indian?) was analysed by Braconnot (*Ann. de Chim.* lxviii. 60) who found the constituents to be as follows:—*volatile oil* 8, *resin* 56, *gum* 30, *matter like gum, insoluble in water and alcohol* 5·2; loss 0·8.

Physiological Effects.—Olibanum is regarded as a stimulant of the same kind as the resins or oleo-resins (p. 73).

Uses.—It is rarely employed internally. Formerly it was used to restrain excessive discharges from the mucous membranes. Thus it was given in chronic diarrhœa, old catarrhs, but more especially in leucorrhœa and gleet. It was also administered in affections of the chest; as hæmoptysis. It has been used as an ingredient of stimulating plasters. As a fumigating agent it is employed to overpower unpleasant odours, and to destroy noxious vapours.

Administration.—Dose, ℈ss. to ℈j., formed into an emulsion by the aid of the yolk of an egg.

Balsamoden'dron Myr'rha, Nees, L.—*The Myrrh-Tree.*

Balsamodendron (Protium?) Myrrha, *E.*

***Sex. Syst.* Octandria, Monogynia.**

(Gummi-resina, *L.*—Gummy-resinous exudation, *E.*—Myrrha, *D.*)

HISTORY.—The earliest notice of myrrh occurs in the Old Testament (*Gen.* xxxvii. 25), from which it appears that this gum-resin was an object of trade with the Eastern nations more than 3,500 years ago. In the Hebrew language it is termed *Mur*, in allusion to its bitterness. The Greeks, who were well acquainted with it, called it Σμύρνα; or, in the Æolic dialect, Μύῤῥα. Hippocrates (see Dierbach, *Arzneim. des Hippok.* p. 224) employed it in medicine in several diseases; and Dioscorides (lib. i. cap. 77) describes several kinds of it, the most esteemed being the *Troglodytica*. Some of the ancient poets tell us that the name of this gum-resin was derived from Myrrha, the daughter of Cinyras, King of Cyprus, who fell in love with her own father, and after having had criminal intercourse with him, fled to Arabia, where she was changed into a tree which still bears her name.

Notwithstanding the early knowledge of, and acquaintance with, the uses of myrrh, we had no accurate account of the tree which yields it until the return of Ehrenberg from his travels with Hemprich, during 1820-25, in various parts of Africa and Asia, and who brought with him a specimen of the tree, which has been described and figured by Nees von Esenbeck (*Beschr. Offic. Planz.*) under the name of Balsamodendron Myrrha. The first notice of this discovery of these travellers which I have met with, is in Alex. Humboldt's "*Bericht über die naturhistorischen Reisen der Herren Ehrenberg und Hemprich*," &c., published at Berlin in 1826.

BOTANY. *GEN. CHAR.*—*Flowers* irregular. *Calyx* four-toothed, persistent. *Petals* four, linear-oblong; æstivation induplicate-valvate. *Stamens* eight, inserted under the annular disk; elevated warts between the stamens. *Ovary* one. *Style* one, short, obtuse. *Berry* or *drupe* ovate, acute, with four sutures, one- to two-celled; cells one-seeded.—Oriental *trees* giving out balsam. *Leaves* pinnated; leaflets three to five, sessile, without dots (D. C.)

SP. CHAR. — *Stem* shrubby, arborescent; branches squarrose, spinescent. *Leaves* ternate; *leaflets* obovate, obtuse, obtusely tooth-letted at the apex, the lateral smooth. *Fruit* acuminate (*Nees*).

FIG. 223.

Balsamodendron Myrrha.

a. A leaf. b. The fruit.

Bark pale ash-grey, approaching white. *Wood* yellowish white; both it and the bark have a peculiar odour. *Leaves* on short stalks. *Flowers* unknown. *Fruit* ovate, smooth, brown, somewhat larger than a pea; surrounded at the base by a four-toothed calyx, and supported on a very short stalk.

HAB.—Gison, on the borders of Arabia Felix.

This species is considered by Lindley (*Fl. Med.* 170) to be identical with the *Amyris Kataf* of Forskäl (*Fl. Ægypt. Arab.* 80), the *Balsamodendron Kataf*, Nees; *Protium Kataf*, Lindley. But the identity of the two plants is by no means satisfactorily demonstrated. *A. Kataf* is distinguished, 1st, by the absence of thorns; 2dly, by the leaves being four times larger, and the lateral leaflets agreeing both in form and size with the terminal ones; 3dly, the fruit (according to Forskäl) is round, with a depressed umbilicus at the point.

Exudation of Myrrh.—Myrrh, according to Ehrenberg, exudes, like cherrytree gum, from the bark of the tree. It is at first soft oily, and of a pale-yellow colour; but, by drying, becomes darker and redder.

Description. — Myrrh (*gummi-resina myrrha; gummi myrrha*) is imported from the East Indies in chests, each containing from one to two hundred weight. Formerly the finest kind was brought from Turkey (*Turkey myrrh*), and an inferior one from the East Indies (*East India myrrh*); but at the present time nearly the whole is brought from India. In 1839, duty (6s. per cwt.) was paid on 216 cwt. Sometimes the same chest contains myrrh of all qualities, which is then termed *myrrh in sorts* (*myrrha naturalis* seu *myrrha in sortis*); but commonly it is brought over more or less sorted.

Myrrh is only partially soluble in water, alcohol, or ether: the first of these liquids takes up the gum principally, the two latter the resin and oil. Water takes up more of the myrrh than alcohol does. Alkaline solutions are good solvents for myrrh. A few drops of nitric acid dropped on a small fragment of myrrh, or on a concentrated tincture, developes a red colour.

1. *Myrrh of first quality; Turkey myrrh* (*Myrrha turcica; M. vera* seu *rubra* vel *pinguis*).—It occurs in pieces, of irregular forms and of variable sizes, and which consist of tears (either distinct or agglomerated), usually covered with a fine powder or dust. In a chest of it a few pieces of fine quality may sometimes be met with, nearly as large as a man's first. The colour varies, being pale reddish yellow, red, or reddish-brown. The pieces are fragile, semi-transparent, with a dull, in part splintery, fatty kind of fracture. In consequence of imperfect desiccation the largest and finest pieces often present internally, opaque, whitish or yellow striæ, or veins, which have been compared by Dioscorides, Pliny, and many others, to the white marks on the nails. The odour of myrrh is aromatic and balsamic, peculiar, but to most persons pleasant; the taste is bitter, acrid, and aromatic. The purest, palest, and most odorous pieces are sold as *picked myrrh* (*myrrha electa* seu *selecta*).

2. *Myrrh of second quality; Myrrh in distinct small tears or grains.* Imported from the East Indies in chests. It consists of distinct tears or grains, which are rounded or irregular, and vary in size from that of a pin's head to a pepper-corn, none of them in my specimen being so large as a small pea. They are somewhat shiny, more or less transparent, and vary in colour from pale or whitish yellow to reddish-brown. It consists of tears of myrrh intermixed with fragments of gum-arabic, and of some resin very like mastic, or juniper. Many druggists in this country regard it as merely the siftings of the finest kind, but I cannot agree with them in this opinion.

3. *Myrrh of third quality; East India Myrrh* (*Myrrha indica* seu *ostindica*). Formerly this was the only kind imported from the East Indies. I occurs in pieces, which are darker coloured than those of the so-called Turkey myrrh, and whose average size does not exceed that of a walnut. It is often mixed with other substances, particularly with *Indian Bdellium* (the produce of *Amyris Commiphora*), and with a substance of similar appearance to dark red-coloured Senegal gum (*Opocalpasum ?*)

Composition.—Myrrh was analyzed, in 1816, by Pelletier (*Ann. de*

Chim. lxxx. 45), and in 1819 by Braconnot (*Ibid.* lxviii. 52) and by Brandes (*Berl. Jahrb.* xxii. 275)

	Brandes.	Braconnot.	Pelletier.
Volatile oil	2·60	2·5	34
Resin, soft	22·24	23·0	
Resin, hard	5·56		
Gum, soluble (*Arabine?*)	54·38	46·0	66
Gum, insoluble	9·32	12·0	
Salts (benzoates, malates, phosphates, sulphates, and acetates of potash and lime)	1·36	—	—
Impurities	1·60	—	—
Loss	2·94	16·5	—
	100·00	100·0	100

1. *Volatile Oil of Myrrh.*—Colourless, though by age it becomes yellowish. It is a thin fluid, heavier than water, having the odour and taste of myrrh, and being soluble in alcohol, ether, and the fixed oils. It partially evaporates in the air, the residue being a glutinous varnish-like substance. It readily distils over with water, but not with spirit. With sulphuric, nitric, and hydrochloric acids, it forms red solutions.

2. *Resin of Myrrh.*—According to Brandes, this is of two kinds, both of which are soluble in alcohol.

(*a.*) *Soft resin.*—Odorous, soft at ordinary temperatures, and soluble in ether. Unverdorben regards it as a mixture of hard resin and volatile oil.

(*b.*) *Hard resin* (*Myrrhic acid?*)—Inodorous, hard, insoluble in ether, soluble in caustic alkalies, forming resinates (*myrrhates?*). The resinate of baryta is soluble in water, but not in alcohol.

3. *Gum of Myrrh.*—Is also of two kinds. (*a.*) *Soluble* in water: the solution forming precipitates with alcohol and the salts of lead, silver, the protosalts of tin, and of mercury. (*b.*) *Insoluble* in water.

Physiological Effects.—In *small* or *moderate doses*, myrrh promotes the appetite, creates an agreeable warmth in the stomach, and occasions slight constipation. Its continued employment in these quantities assists the assimilative functions, increases the muscular activity, gives greater firmness to the solids, and diminishes excessive secretion from the mucous membranes.

In *large doses* (as from half a drachm to a drachm) it excites a disagreeable sensation of heat in the stomach, and in irritable conditions of this viscus may even bring on a slight inflammatory state; it accelerates the frequency and increases the fulness of the pulse, gives rise to a febrile condition of the body, and creates a feeling of warmth in the mucous membrane (especially in the membrane lining the air-passages). It has been supposed to have a specific stimulant operation on the uterus, and has, in consequence, been termed emmenagogue; but it does not appear to have any title to this appellation.

The local operation of myrrh is that of a mild astringent and a moderate stimulant. Kraus (*Heilmittellehre*) says it is very similar to that of cinchona. In its remote effects myrrh partakes of both the tonic and stimulant characters, and hence some have denominated it a *tonico-stimulant*; and as its stimulant powers are analogous to those of the balsams, it has also been called a *tonico-balsamic*.

Myrrh differs from the fetid gum-resins (asafœtida, galbanum, &c.) in not possessing that influence over the nervous system which has led to the use of the latter in various spasmodic diseases, and to their denomination of antispasmodics. From the balsamic substances it is distinguished by its tonic influence. It has some relation to cascarilla, but is more stimulant.

Uses.—The employment of myrrh is indicated in diseases characterised by feebleness of the vascular action, by weakness of the muscular fibre, and by excessive secretion from the mucous membranes. Relaxed and leucophlegmatic constitutions best admit of its use. It is frequently associated with tonics, especially the chalybeates, or with aloes. Indeed it is rarely used alone. It is contra-indicated in inflammatory diseases, and in plethoric individuals. It is used in the following cases:—

1. *In disordered conditions of the digestive organs* arising from or connected with an atonic condition of the alimentary canal, as in some forms of dyspepsia, apepsia, flatulence, &c.

2. *In disordered states of the menstrual functions* characterised by a lax and debilitated state of the system, as in many cases of amenorrhœa and chlorosis.

3. *In excessive secretion from the mucous membranes* unconnected with inflammatory symptoms, and accompanied by marks of debility. In chronic pulmonary catarrh, for example, it is sometimes admissible and useful. It has also been used to check puriform expectoration in phthisis pulmonalis, though it is now rarely employed for this purpose, as in most cases it proves either useless or injurious. In mucous discharges from the urino-genital organs, as well as from the alimentary canal, it has also been administered.

4. *As an external application*, myrrh is employed for various purposes. Thus it is used as a *dentifrice*, either alone or mixed with other substances; and in caries of the teeth, and in a spongy or ulcerated condition of the gums, is very serviceable. As a *gargle* in ulcerations of the throat, tincture of myrrh, diluted with water, is frequently employed. In *foul ulcers*, myrrh has been used to destroy unpleasant odour, to promote granulations, and to improve the quality and diminish the quantity of secreted matters: for these purposes it has been applied in a pulverulent form, as an ointment, or as a wash.

Administration.—Dose, gr. x. to ʒss. It is given in the form of powder, pill, or emulsion. The aqueous infusion and extract, which have been recommended for their mildness, are seldom employed, and very rightly so, as I conceive. Myrrh is a constituent of several pharmacopœial preparations; as *mistura ferri composita* (p. 553), *pilulæ ferri compositæ* (p. 554), *pilulæ aloës cum myrrhâ* (p. 649), *decoctum aloës compositum* (p. 650), *pilulæ rhei compositæ* (p. 821), and *pilulæ galbani compositæ* (p. 1048).

Tinctura Myrrhæ, L. E. D. (Myrrh, bruised [in moderately fine powder, *E.*], ℥iij.; Rectified Spirit, Oij. [Oj. and f℥xiij. *E.*]; Oss. and Proof Spirit, Oiss. *D.*] Macerate for fourteen days [seven, *D.*], and filter, *L. D.* "Pack the myrrh very gently, without any spirit, in a percolator; then pour on the spirit; and when thirty-three fluid ounces have passed through, agitate well, to dissolve the oleo-resinous matter which first passes, and which lies at the bottom. This tincture is much less conveniently obtained by the process of digestion for seven days," *E.*)

—Tonic and stimulant. Seldom employed internally, and then usually as an adjunct. Dose, ʒss. to ʒj. It is applied as a stimulant to foul and indolent ulcers. Diluted with water (which renders it slightly milky by the separation of the resin, but no precipitate is formed), it is used as a wash for the mouth in ulceration and sponginess of the gums, and as a gargle in affections of the throat.

Other Medicinal Terebinthaceæ.

The history and origin of *Elemi* is involved in great obscurity. It appears that the resinous products of various terebinthaceous trees have been described under this name. The Edinburgh College correctly, as I conceive, declare elemi to be the "*Concrete resinous exudation from one or more unascertained plants.*" The London and Dublin Colleges, on the other hand, call it the resin of *Amyris elemifera* of Linnæus (see his *Mat. Med.*) But this distinguished botanist has confounded, under one name, two distinct plants; viz. *Icica Icicariba*, Decandolle (*Icicariba*, Pison), a Brazilian tree (yielding, according to Pison, a resin similar to the so-called *gum elemi*), and *Amyris Plumieri*, Decandolle, a native of the Antilles, which also yields a resin. To assist in determining the origin of elemi, I have taken much pains to ascertain its commercial route; and I find that all the importations of it, which I can trace, were from Amsterdam or Hamburgh. Pomet also states, that true elemi was brought from Holland: whence I conclude that it is the produce of a Dutch settlement. But one of the importers expressed to me his belief (in which I do not coincide), that the elemi brought from Holland was spurious, being made of common frankincense (p. 707). It would appear that formerly it came from Ethiopia by way of the Levant. It is possible that it may be the produce of the *Canarium Zephyrinum sive sylvestre primum Canari Barat* of Rumphius (*Herb. Amb.* lib. iii. cap. ii. p. 153), which he says yields a resin so like elemi that it may be taken for it, and he puts a query, whether this tree may not be the source of it. I have met with three kinds of elemi:—1st. *Elemi in flag leaves; Résine elemi en pains*, Guibourt; *Resina Elemi orientalis*, Martius. This is imported from Holland in triangular masses, weighing from one to two pounds each, enveloped in a palm-leaf. It agrees in most of its properties with the next variety. Martius ascribes it to *Amyris zeylanica* (*Balsamodendron zeylanicum*, Kunth). But if this were correct, it would doubtless be imported direct from Ceylon to England, which it is not. —2nd. *Elemi in the lump.* This differs from the following kind only in its much paler yellow colour.—3rd. *Brazilian Elémi; Résine élémi du Brésil*, Guibourt. This variety I received from Professor Guibourt. If it be really brought from the Brazils, it is doubtless obtained from *Icica Icicariba* (Decandolle) by incisions into the stem, and is gathered twenty-four hours afterwards. "It is imported in cases containing two or three hundred pounds each. It is soft and unctuous, but becomes hard and brittle by cold and age. It is semi-transparent, of a yellowish-white, mixed with greenish points; its odour is strong, agreeable, analogous to that of fennel, and owing to a volatile oil which may be obtained from it by distillation. As it owes its properties to this oil, it should be selected recent, not too dry, and strongly odorous" (*Guibourt.*) It is soluble in alcohol, with the exception of its impurities, and a white, opaque, insipid, inodorous, crystallizable substance, called *elemine*, which is soluble in boiling alcohol. Martius describes *African Elemi* (the genuine elemi of the ancients) as being in small pieces like scammony, and having an acrid taste. Bonastre analyzed elemi, and found its constituents to be, *volatile oil* 12·5, *resin soluble in both hot and cold alcohol* 60·0, *resin soluble in hot but not in cold alcohol* (*elemine*) 24·0, *bitter extractive* 2·0, impurities 1·5.

The physiological effects of elemi are similar to those of the terebinthinates. It is, however, never employed internally. Its principal or sole use is as a constituent of the *unguentum elemi*, L. D., which is composed, according to the *London College*, of Elemi, lb.j.; Common Turpentine, ℥x.; Suet, lb.ij.; Olive Oil, f℥ij. The Elemi and Suet are melted together and then removed from the fire, and the turpentine and oil immediately added: the mixture is then expressed through linen. The *Dublin College* employs lb.j. of Elemi, lb.ss. of White Wax, and lb.iv. of Prepared Hogslard.—Elemi ointment is stimulant and digestive. It is applied as a stimulant to old and indolent ulcers, and to promote the discharge from issues and setons. It is an imitation of the liniment recommended by Arcæus, in 1574 (*De recta curand. Vulner. Ratione*, Amst. 1658).

Balm of Gilead (*Balsamum gileadense; B. de Mecca; Opobalsamum; Balm* of the Old Testament; Βάλσαμον of Theophrastus and Dioscorides) is procured from *Balsamodendron gileadense*, a middling-sized tree growing in Arabia. Mr. Bruce says it is obtained by cutting the bark of the tree with an axe, and receiving the juice in a small earthen bottle. The quantity obtained in this way, is, however, very small; and none of it, it is said, reaches this country, that which occasionally comes here being obtained by boiling the branches and leaves in water. It is a whitish, turbid, thick, very odorous liquid, which resinifies, and becomes yellow by keeping. Trommsdorf (Thomson, *Org. Chem.* 523) analyzed it, and found it to consist of *volatile oil* 30·0, *soft resin insoluble in alcohol* 4·0, *hard resin soluble in alcohol* 64·0; *extractive* 0·4, loss 1·6. Bonastre (*Journ. de Pharm.* xviii. 95) also analyzed it. Its physiological effects are believed to be similar to balsam of copaiva and the liquid turpentines. The most wonderful properties were formerly ascribed to it. It is rarely or never employed by Europeans, but is adapted to the same cases as the terebinthinates (see p. 708). The Asiatics use it for its odoriferous, as well as its medicinal, qualities.

FIG. 224.

Balsamodendron gileadense.

The term *Bdellium* is applied to two gummy-resinous substances. One of these is *Indian Bdellium*, or *false Myrrh* (the *Bdellium* of Scripture), which is obtained from *Amyris* (*Balsamodendron?*) *Commiphora*. Dr. Roxburgh (*Fl. Ind.* ii. 245) says, that the trunk of this tree is covered with a light-coloured pellicle, as in the common birch, which peels off from time to time, exposing to view a smooth green coat, which in succession supplies other similar exfoliations. This tree diffuses a grateful fragrance, like that of the finest myrrh, to a considerable distance around. Dr. Royle (*Illustr.* p. 176) was informed that this species yielded bdellium; and in confirmation of his statement I may add, that many of the pieces of this bdellium in my museum have a yellow pellicle adhering to them, precisely like that procured from the common birch, and some of the pieces are perforated by spiny branches —another character serving to recognize the origin of this bdellium. Indian bdellium has considerable resemblance to myrrh. Many of the pieces have hairs (of the goat?) adhering to them. The other kind of bdellium is called *African Bdellium*, and is obtained from *Heudolotia africana* (Richard and Guillemin, *Fl. de Sénégambie*). It is a native of Senegal, and is called by the natives, who make toothpicks of its spines, *Niottout*. It consists of rounded or oval tears, from one to two inches in diameter, of a dull and waxy fracture. By age they become opaque, and covered, externally, by a white or yellowish dust. It has a feeble but peculiar odour, and a bitter taste. Pelletier (*Ann. de Chim.* t. lxxx. p. 39) found it to consist of *resin* 59·0, *soluble gum* 9·2, *bassorin* 30·6, *volatile oil and loss* 1·2.

ORDER 60. RHAMNA'CEÆ, *Lindley*.—THE BUCKTHORN TRIBE.

RHAMNI, *Jussieu*.—RHAMNEÆ, *Decandolle*.

ESSENTIAL CHARACTER.—Tube of the *calyx* adherent to the ovary, lobes valvate in æstivation, definite in number, four or five. *Petals* as many as (rarely none), and alternate with, the lobes of the calyx; often squamiform with a concave limb. *Stamens* as many as the petals, and opposite to them; *anthers* two-celled. *Ovary* either adnate to the whole of the calyx, or adherent at the lower part or middle, two- or four-celled; cells with one ovule each. *Style* one; *stigmas* two to four. *Pericarp* usually indehiscent, baccate, drupaceous, or samaroïdeous, rarely capsular. *Seeds* erect, destitute of aril; *albumen* none, or usually fleshy; *embryo* straight in the axis of the seed, with an inferior *radicle* and somewhat foliaceous *cotyledons*.—*Shrubs* or small *trees*. *Leaves* simple, alternate, rarely opposite, often with stipules. *Flowers* small, often greenish (D. C.)

PROPERTIES.—Require farther examination. The fruit of Rhamnus contains purgative and colouring matters: that of Zizyphus is acidulous, saccharine, and alimentary.

Rham'nus cathar'ticus, Linn. L. E. D.—*Common Buckthorn.*

Sex. Syst. Pentandria, Monogynia.

(Baccæ, *L. D.*—Fruit, *E.*)

History.—According to Dr. Sibthorp (*Prod. Fl. Græcæ*, i. 155), the ῥαμνος of Dioscorides is *Lycium europæum*. The earliest notice of Rhamnus catharticus is in Tragus (see Sprengel, *Hist. Rei Herb.* ii. præf. xi.)

Botany. *Gen. Char.*—*Calyx* four- or five-cleft, often circumscissile in the middle after flowering; the base persistent under, and adherent with, the fruit. *Petals* alternate with the lobes of the calyx, or none. *Stamens* inserted opposite the petals. *Style* two- to four-cleft. *Fruit* almost juiceless, or baccate, two- to four-celled; *cells* in the juiceless fruit, separable, one-seeded (rarely two-seeded), dehiscing inwards by a longitudinal chink. *Seeds* oblong, marked at the external side by a deep groove, which is broader towards the base (D. C.)

Sp. Char.—Erect. *Leaves* ovate, toothed. *Flowers* fascicled, polygamous-diœcious. *Berries* four-seeded, somewhat globose (D. C.)

A spreading *shrub* with terminal *spines*. *Leaves* with four or six strong lateral nerves parallel with the margin or rib. *Stipules* linear. *Flowers* yellowish-green: the *males* with broader *petals*, four *stamens* and one short *style*, without either ovary or stigma: the *females* smaller, with four *stigmas* projecting beyond the calyx, and rudimentary stamens. *Fruit* black, four-celled.

Hab.—Indigenous; in hedges, groves, and thickets.—Flowers in May. The fruit is ripe in September.

Description.—Buckthorn berries (*baccæ rhamni cathartici*) are about the size of the fruit of juniper. They are black externally, and contain four seeds, surrounded by a deep violet-red juicy parenchyma. The juice is reddened by acids, and rendered green by alkalies. The berries are collected in September.

Composition.—The expressed juice of buckthorn has been examined, chemically, by Vogel (*Bull. de Pharm.* iv. 64), and by Hubert (*Journn. de Chim. Méd.* vi. 193).

Vogel's Analysis.	*Hubert's Analysis.*
Peculiar colouring matter.	Green colouring matter.
Acetic acid.	Acetic and malic acids.
Mucilage.	Brown gummy matter.
Sugar.	Sugar.
Nitrogenous matter.	Bitter substance (*cathartine ?*).
Buckthorn juice.	Buckthorn juice.

1. *Purgative principle.*—The nature of the purgative principle of buckthorn requires further elucidation. Hubert asserts that it possesses the properties of cathartine before described (see p. 1167); but his experiments are not conclusive. As from 25 to 30 berries are sufficient to purge, while an ounce of the juice is required to produce the same effect, it is probable that the greater part of the purgative principle resides in the marc left after the expression of the juice.

2. *Colouring matter.*—It is soluble in water, less so in alcohol, and insoluble in ether and oils. Acids redden it; whereas alkalies render it green. Vogel thinks its proper colour is green, and that it only becomes purple by the action of the acetic acid, which is developed in the ripe fruit. When the juice is evaporated to dryness with lime, it constitutes *sap-green*, or the *vert de vessie* of the French.

3. *Mucilage.*—The mucilage of buckthorn is of a peculiar nature. It disappears by fermentation. It is abundant in the recent juice, to which it gives consistence.

Physiological Effects.—The berries, as well as their expressed juice, are powerful hydragogue cathartics; usually griping and causing great thirst, and sometimes operating with considerable violence. "Syrup of buckthorn," says Sydenham (*Works* by Dr. Pechey, p. 391, 4th ed.), "purges in a manner only water, and evacuates a great quantity of it, and does not disturb the blood, nor render the urine high coloured, as other purges usually do; and this syrup has but one ill property—viz. that whilst it is working, it makes the sick very thirsty. But if you give the greatest dose of it to those that are difficultly purged, it will not give many stools, nor bring away so much water from them as it ought."

Uses.—Buckthorn berries were formerly employed as cathartics, but their violent operation, and the sickness, griping, and thirst occasioned by them, have led to their disuse. "They be not meete to be ministered," says Dodoens (*New Herbal*, by Lyte, p. 501, Lond. 1619), "but to young and lustie people of the countrie, which doe set more store of their money than their lives." The syrup is the only preparation now in use.

Administration.—Dose of the *recent berries*, ℈j.; of the *dried* ones, ʒj.; of the *expressed juice*, f℥ss. to f℥j.

Syrupus Rhamni, L. E. D. (Fresh Juice of Buckthorn Berries, Oiv. [Oijss. *D.*]; Ginger sliced, Allspice bruised, of each, ℥vj. [℥iij. *D.*]; Pure Sugar, lb. iv. [℥xxix. *D.*] Set by the juice for three days, that the dregs may subside, and strain. To a pint of the clear juice add the Ginger and Allspice; then macerate for four hours with a gentle heat, and strain; boil down the residue to a pint and a half; mix the liquors; add the sugar, and dissolve).—Cathartic. It is employed as an adjunct to purgative and occasionally to diuretic mixtures. Sydenham found it, in one case, most beneficial in dropsy; and "with the juvenile confidence of an experienced man, verily believed," as he tells us, that he "had got a medicine that would cure any manner of dropsy;" but he found his "mistake in a few weeks." Dose ℥ss. to ℥j.

Order 61. Simaruba'ceæ, *Lindley*.—The Quassia Tribe.

Simarubeæ, *Richard*.

Essential Character. — *Flowers* hermaphrodite, or rarely by abortion unisexual. *Calyx* four- or five-partite, persistent. *Petals* four or five, hypogynous, erect, deciduous. *Stamens* equal in number, or twice as many as, the petals, inserted on an hypogenous disk, free. *Ovary* with lobes as numerous as the petals; *style* one, filiform, enlarged at the base. *Carpels* as many as the petals, articulated on the axis, capsular bivalved, dehiscing inwardly, monospermous. *Seeds* exalbuminous, pendulous; *cotyledons* two, thick; *radicle* short, superior.—*Trees* or *shrubs* with a very bitter bark and milky juice. *Leaves* alternate, pinnate, without stipules (D.C.)

Properties.—Bitterness is the prevailing quality of the order (see *Quassia*).

Simaru'ba ama'ra, Aublet, E.—*Bitter Simaruba or Mountain Damson.*

Simaruba officinalis, *Decandolle*, *L.*—Quassia Simaruba, *Linn. D.*

Sex. Syst. Decandria, Monogynia.

(Radicis cortex, *L.*—Root, *E.*—Cortex radicis, *D.*)

History.—Simaruba bark was first known to Europeans in 1713, when some of it was sent to Paris, from Guiana, as the bark of a tree called by the natives *Simarouba*, which they employed with great success in dysentery. The first authentic botanical account of the tree was given by Dr. Wright (*Trans. Royal Soc. of Edinb.* vol. ii. part ii. p. 73).

BOTANY. *GEN. CHAR.* — *Flowers* unisexual. *Calyx* small, cup-shaped, five-toothed or parted. *Petals* five, longer, spreading. *Males:* stamens nearly equal to the petals, arranged around a receptacle bearing at its apex five very minute lobes (rudiments of ovaries) or sometimes none. *Females: Ovaries* five, placed on an even disk, surrounded at the base by ten short hairy scales (rudiments of stamens). *Styles* the same number, short, distinct at the base; there united into one, crowned by a broader five-lobed stigma. *Fruit* five drupes (Lindley).

SP. CHAR.—Male *flowers* decandrous. *Stigma* five-partite. *Leaves* abruptly pinnate; *leaflets* alternate, somewhat stalked, pubescent beneath (D. C.)

A very tall *tree*. *Roots* long and creeping. *Stem* thick; *bark* bitter, internally white, fibrous and tough, externally blackish and furrowed in the old trees, but smooth and grey, with yellow spots, in the young ones. *Leaves* alternate; *leaflets* alternate, two to nine on each side, oval, firm, mucronate. *Flowers* small, yellowish-white, some male, others female, mixed, in panicles. *Fruit* of five, ovate, black, smooth capsules, placed on a fleshy disk.

DESCRIPTION.—The simaruba bark (*cortex simarubæ*) of the shops, is the bark of the root (*cortex radicis simarubæ*), and is brought from Jamaica in bales. It is odourless, but bitter, and occurs in broad, folded, very fibrous pieces, several feet long, which are externally rough, warty, and marked with transverse ridges. The epidermis is of a greyish or whitish-yellow colour: beneath it the bark is darker, and yellowish-brown. On the inner surface the bark is pale yellowish-white.

COMPOSITION.—Simaruba bark was analyzed by Morin (*Journ. de Pharm.* viii. 57), who found in it the following substances:—*Quassite, a brittle resin, an aromatic volatile oil having the odour of benzoin, woody fibre, ulmin, an ammoniacal salt, malic acid,* traces of *gallic acid, malate and oxalate of lime, oxide of iron,* and *silica.* No notice is taken of the *mucilage*, which, according to Pfaff (*Syst. d. Mat. Med.* ii. 74), constitutes nearly one-fourth part of the bark.

PHYSIOLOGICAL EFFECTS.—In small doses simaruba acts like the simple bitter tonics, whose effects have been already described (p. 79). In full doses, however, it causes vomiting and purging, and is said also to promote perspiration and urine. Dr. Wright states, that negroes are less affected by it than whites.

Desbois de Rochefort (*Cours Elément. de Mat. Med.* i. 357) classed it among emetics; and Bichat proposed it as a substitute for ipecacuanha. It is, however, usually arranged with the tonics.

USES.—Simaruba may be employed in the same cases as other vegetable bitters (see p. 79 and 896). It has been principally celebrated in *dysentery* (whence the Germans call it *Ruhrrinde*, or *dysentery-bark*) by Dr. Wright (*Account of Quassia Simaruba*) and others. It is, of course, only applicable in the latter stages of the acute and the asthenic and chronic forms of the disease. More recently, Dr. O'Brien (*Trans. of the King and Queen's College of Phys.* Dubl. vol. v. p. 237) has borne testimony to its good effects, when given in conjunction with opium, in epidemic dysentery. It has also been employed in the advanced stages of *diarrhœa.* Like other vegetable tonics, it may be substituted in *dys-*

pepsia, *anorexia*, and *intermittents*. It is a remedy, however, which is seldom used.

INFUSUM SIMARUBÆ, L. E. D. (Simaruba bark, bruised, ℥iij; [ʒss. *D.*]; Boiling [distilled, *L.*] Water, Oj. [Oss. *D.*] Macerate for two hours in a lightly covered vessel, and strain [through linen or calico, *E.*]).—Tonic; in large doses emetic. Dose, as a tonic, f℥j to f℥ij.

Picræ'na excel'sa, Lindley, E.—*The Lofty Bitter-Wood Tree.*

Quassia excelsa, *Swartz, L. D.*—Picrania amara, *Wright.*—Quassia polygama, *Lindsay.*

Sex. Syst. Decandria, Monogynia.

(Lignum, *L. D.*—Wood chiefly of Picræna excelsa, seldom of Quassia amara, *E.*)

HISTORY.—The wood of this tree has been introduced as a substitute for that of Quassia amara, with which it has often been confounded.

BOTANY. *GEN. CHAR.*—*Flowers* polygamous. *Sepals* 5, minute. *Petals* 5, longer than the sepals. *Stamens* 5, about as long as the petals, rather shaggy; *anthers* roundish. *Ovaries* 3, seated on a round, tumid receptacle. *Style* 3-cornered, bifid: *stigmas* simple, spreading. *Fruit* 3 globose, 1-celled, bivalved drupes, which are distant from each other and placed on a broad hemispherical receptacle (Lindley).

SP. CHAR.—The only species.

A tall, beautiful timber *tree*, sometimes 100 feet high. *Leaves* pinnate with an odd one; *leaflets* 4- 8 pairs, opposite, stalked, oblong, acuminate, unequal at the base. *Racemes* towards the ends of the branchlets, axillary, very compound. *Flowers* small, pale yellowish green. *Drupe* size of a pea, black, shining, round (Lindsay, *Trans. Roy. Soc. Edinb.* iii. 205.)

HAB.—Jamaica.

DESCRIPTION.—Quassia wood (*lignum quassiæ*),—sometimes called Jamaica quassia wood (*lignum quassiæ jamaicensis*) in order to distinguish it from the wood of Quassia amara,—is imported from Jamaica in billets of various sizes (sometimes a foot in diameter, and several feet in length), covered externally with a smooth brittle bark. The wood is white, but by exposure to the air becomes yellowish; it has no odour, but a most intensely bitter taste. Floors made of quassia wood retain for many years their bitterness. An efflorescence of nitrate of potash is frequently observed on it (Planche, *Journ. de Pharm.* xxiii. 542).

ADULTERATION.—Quassia wood has recently been somewhat scarce, and, in consequence, its chips have been adulterated with the chips of other woods; but the intense bitterness of the genuine wood readily distinguishes it.

COMPOSITION.—Though quassia wood has been the subject of repeated chemical investigation, I am unacquainted with any complete analysis of it. But from the experiments of Pfaff (*Syst. d. Mat. Med.* ii. 21) and others, the following appear to be the principal constituents of it: *volatile oil* a minute trace, *a bitter principle* (quassite), *gummy extractive*, *pectin*, *woody fibre*, and *various salts* (as oxalate, tartrate, and sulphate of lime, chlorides of calcium and sodium, an ammoniacal salt, and nitrate of potash).

Quassite; Bitter Principle of Quassia; Quassin.—Obtained by adding lime water to a concentrated aqueous decoction of quassia (to separate the pectin and other substances), evaporating and treating the residue with alcohol, which takes up the quassite, a brown colouring matter, and some salts. By repeated solution and evaporation in alcohol with a little ether the quassite is obtained pure. Quassite occurs in small, white, prismatic crystals, which are fusible, odourless, intensely bitter, readily soluble in alcohol, but very slightly so in water or ether. Its solubility in water is increased by several salts and vegetable principles. Its watery solution is precipitated (white) by tannin, but not by iodine, chlorine, corrosive sublimate, salts of iron, acetate, or diacetate of lead. It is a neutral body, though soluble in sulphuric and nitric acids. It consists of *carbon* 66.912, *hydrogen*, 6.827, and *oxygen* 26.261; or $C^{10} H^6 O^3$ (*Wiggers, Ann. d. Pharm.* xxi. 40; *Brit. Ann. of Med.* for 1837, p. 561).

Physiological Effects. (*a.*) *On animals.*—From recent experiments it appears that quassia wood acts on animals as a narcotic poison. Dr. Wright (*Med. Plants of Jamaica*) tells us that no insect will live near cabinet work made of it. It has been long known that an aqueous infusion of this substance was an excellent fly-poison; but Hartl, one of Buchner's pupils, has lately shown that it also possesses poisonous properties with respect to the larger animals (Buchner, *Toxikol.* s. 266). Thus he found that a rabbit, into a wound of whose thigh a grain of the alcoholic extract of quassia had been introduced, lost his power and liveliness, and died on the third day. A second experiment made on an older and stronger animal was attended with the same results. No pain appeared to be experienced, nor were there any marks of irritation or inflammation observable after death. Kurtz (G. A. Richter, *Ausf. Arzneimittell.* Suppl. Bd. s. 42. 1832) mentions that complete paralysis of the hind extremities of a dog affected with the mange (*Fetträude*), was brought on by washing the ulcers with decoction of quassia: in seven hours, however, it disappeared.

These experiments seem to show that the bitter principle of quassia possesses properties somewhat like those of the *Amer* of Welther.

(*b.*) *On man.*—In the usual medicinal doses, quassia operates as a stomachic and tonic—that is, it is bitter to the taste, promotes the appetite, and assists the digestive functions. It is devoid of all irritant, stimulant, and astringent properties; and has been, therefore, sometimes taken as a type of the simple or pure bitters. It is more powerful than, but in other respects analogous to, gentian in its operation. "We can find nothing in this wood," says Dr. Cullen (*Mat. Med.*) "but a pure and simple bitter;"—and he goes on to observe that he believes it to be an excellent substance, capable of doing all that any pure and simple bitter can do, but no more.

Does it act as a narcotic on man, as on other animals? I have employed, and seen others administer quassia most extensively, but never had grounds for suspecting any effect of the kind alluded to. Yet some have observed effects which certainly seem to favour the notion that quassia possesses a specific influence over the cerebro-spinal system. In females endowed with extreme susceptibility, I have seen, says Barbier (*Traité Elém. de Mat. Méd.* i. 250. 2nd ed.), involuntary movements of the arms and legs, produced by the aqueous infusion of quassia. Kraus (*Heilmittell.* s. 412. 1831) says that the continued use of quassia brings on amblyopia (dimness of sight); and Kurtz asserts that the long-continued use of quassia has brought on amaurosis.

Like many other substances, quassia mixed with dead animal matter checks putrefaction; and hence it is termed antiseptic. Ebeling (Schlegel, *Thes. Mat. Med.* t. ii.) many years ago, performed some experiments to determine its power in this respect, compared with other bitters, and found it much superior to several of them.

Uses.—Quassia is employed in the same cases as several other simple bitters, some of which have been already noticed (see p. 79 and 896). Though I am not disposed to place much confidence in the above quoted statements of Barbier, Kraus, and Kurtz, yet a cautious practitioner would avoid employing it in amaurosis and cerebral affections. Quassia is principally employed in *dyspepsia*, *anorexia*, and other stomach disorders of a functional kind of an atonic character, more especially when occurring in a gouty subject. Though it has been beneficially employed in *intermittents*, few practitioners will, I suspect, use it, when they can procure cinchona, quina, or arsenic.

Kraus suggests that it may be useful in intolerance of light, and other diseases of the eye, accompanied with great sensibility without fever or congestion; yet only (he adds) as an adjuvant to hyoscyamus and belladonna.

An infusion of quassia has been proposed as a wash in compound fractures, wounds, and ulcers, to keep off insects. In its use, however, we should bear in mind the effect which Kurtz states was produced on the dog by a wash of this kind.

1. *Infusum Quassiæ*, L. E. D. (Quassia wood, in chips, ℈ij. [ʒj. E.] ℈j. *D.*]; Boiling [distilled, *L.*] Water, Oj. [Oss. *D.*] Macerate for two hours in a lightly covered vessel, and strain [through linen or calico, *E.*] —Tonic. Generally employed in dyspeptic and other stomach affections. It has an advantage over some other vegetable bitter infusions, that chalybeates can be combined with it, without changing its colour. Dose, f℥j. to f℥iij. It is in common use as a fly-poison.

2. *Tinctura Quassiæ*, E. D. (Quassia in chips, ℥j.; Proof Spirit, Oj. and f℥xvij. [Oij. wine measure, *D.*] Digest for seven days, and filter).—Dose fʒss. to fʒij. This tincture possesses all the bitterness of the wood.

3. *Tinctura Quassiæ composita*, E. (Cardamom-seeds bruised, Cochineal bruised, of each ʒij.; Cinnamon, in moderately fine powder, Quassia in chips, of each ʒiij.; Raisins, ℥iv.; Proof Spirit, Oj. and f℥iij. Digest for seven days, strain the liquor, express strongly the residuum, and filter. This tincture may also be obtained by percolation, as directed for the Compound Tincture of Cardamom [see p. 696], provided the quassia be rasped or in powder).—An aromatic tonic. Dose, fʒj. to fʒij.

Other Medicinal Simarubaceæ.

The wood of *Quassia amara* (Linn. E.) has been employed in medicine under the name of Surinam quassia wood (*lignum quassiæ surinamense*).

Fermin mentions that about the year 1714 the flowers of this shrub were highly valued at Surinam on account of their stomachic properties. In 1730, the root is said to have been found in the collection of Seba, a celebrated spice-dealer of Amsterdam. Haller tells us that a relative of his took quassia for an epidemic fever in 1742, and that it was then a well-known medicine. In 1763 Linnæus published a dissertation on this medicine, in which he states that he received specimens of the tree from one of his pupils, C. D. Dahlberg, a military officer and counsellor at Surinam, who had become acquainted with the medical qualities of the root through a black slave named Quassia, who employed it as a secret remedy in the cure of endemic malignant fevers of that place. From this circumstance Linnæus named the tree in honour of the slave, *Quassia*. Rolander, who returned from Surinam in 1756, tells us he saw and conversed with this black, who was almost worshipped by some, and suspected of magic by others. Rolander found him to be a simple man, better skilled in old women's tales than in magic (Murray, *App. Med.* iii. 433). All parts of the plant are intensely bitter. The wood, as I have received it, is in cylindrical pieces (covered by a thin, greyish-white, and bitter bark), not exceeding two inches in diameter, very light, without odour, but having an extremely bitter taste. The chemical and medical properties are similar to the wood of *Simaruba amara.*

ORDER 62. RUTA'CEÆ, *Decandolle.*—THE RUE TRIBE.

ESSENTIAL CHARACTER.—*Sepals* three, four, or five; more or less adherent at the base, so that the calyx is dentate, cleft, or partite. *Petals*, very rarely none, usually as many as the sepals, frequently unguiculate, distinct. *Disk* fleshy-glandular, surrounding the ovary, arising from the receptacle external to the petals, and bearing the stamens on the upper part. *Stamens* usually twice as many as the petals, and then either all fertile or the alternate ones barren. *Carpels* as many as the sepals, sometimes fewer by abortion, either distinct or united at the base, or perfectly connate. *Style* arising from the centre of the ovary, single, divided into as many stigmas as there are ovaries. *Carpels*, when ripe, generally distinct, one-celled, dehiscent, bivalved, cocculose within. *Seeds* affixed to the inner angle, inverse; *embryo* straight, compressed; *radicle* superior.—*Herbs* or *shrubs*, with opposite or alternate stipulate leaves (Condensed from Decandolle).

PROPERTIES.—Volatile oil and bitter matter are the predominating constituents of this order. These confer stimulant, tonic, and, in some cases, narcotic qualities.

Ru'ta grave'olens, Linn. L. E. D.—*Common or Garden Rue.*

Sex. Syst. Decandria, Monogynia.

(Folia, *L. D.*—Leaves and unripe fruit, *E.*)

HISTORY.—This plant was highly esteemed by the ancients; and is frequently mentioned by Hippocrates under the name of Πήγανον. Pliny (*Hist. Nat.* lib. xx. cap. 51, ed. Valp.) says that Pythagoras (who died in the year 489 before Christ) fancied that rue was hurtful to the eyes: but, adds Pliny, he was in error, since engravers and painters eat it with bread or cresses to benefit their eyes. The ancients had a curious idea that stolen rue flourished the best; just as, says Pliny, it is said that stolen bees thrive the worst.

BOTANY. *GEN. CHAR.*—*Calyx* persistent, four-, rarely three- to five-partite. *Petals* as many as the segments of the calyx, unguiculate, somewhat cochleate. *Stamens* twice as many as the petals. *Nectariferous pores* at the base of the ovary, as many as the stamina. *Ovary* on a short, thick stalk. *Style* one. *Capsule* somewhat globose, divided into as many cells as there are petals. *Seeds* affixed by the internal angle; *albumen* fleshy; *embryo* curved; *radicle* long; *cotyledons* linear.—Perennial or suffruticose, fetid *herbs*, of a sea-green colour. *Leaves* alternate. *Flowers* corymbose, yellow, central, often five-cleft (D. C.)

SP. CHAR.—*Leaves* supradecompound; lobes oblong, the terminal one obovate. *Petals* entire or somewhat toothed (D. C.)

A small, branching, hairless *undershrub*, with the lower part only of the stem being woody. *Leaves* dotted, glaucous or bluish green. *Flowers* in umbellate racemes. *Petals* four or five, unguiculate, concave, yellow. The first flower has usually ten stamina, the others eight. It is remarkable that the anthers move in turns to the pistillum, and, after having shed their pollen, retire. *Fruit* roundish, warted, four-lobed, each lobe opening into two valves.

HAB.—South of Europe. Commonly cultivated in gardens.

DESCRIPTION.—The herb (*herba rutæ; herba rutæ hortensis*) is readily recognised by its strong disagreeable odour, which it owes to volatile oil. Its taste is bitter and nauseous. 100 lbs. yield by drying about 22 lbs. The dried herb is greyish-green, and has a less powerful odour. The *unripe fruit* (*fructus immaturus rutæ*) is also officinal in the Edinburgh Pharmacopœia.

Composition.—Rue was analyzed, in 1811, by Mähl (Pfaff, *Mat. Med.* iv. 339), who found in it the following constituents:—*Volatile oil*, *bitter extractive*, *chlorophylle*, *peculiar vegeto-animal matter* precipitable by tincture of nutgalls, *malic acid*, *gum*, *albumen*, *starch*, and *woody fibre*.

1. *Volatile Oil of Rue* (*Oleum Rutæ*).—Is obtained by submitting the herb, with water, to distillation. It is pale-yellow, has a bitterish acrid taste, and a sp. gr. of 0·911. It is somewhat more soluble in water than the other volatile oils.

2. *Bitter Extractive.*—Very bitter, insoluble in alcohol and ether.

Physiological Effects. (*a.*) *On Animals generally.*—Orfila (*Toxicol. Gén.*) found that eighteen grains of oil of rue injected into the veins of a dog, acted as a narcotic, and caused staggering and feebleness of the posterior extremities; but in a few hours the animal had recovered. Six ounces of the juice of rue introduced into the stomach of a dog, killed him within twenty-four hours. The mucous membrane of the stomach was found inflamed.

(*b.*) *On Man.*—The topical action of rue is that of an acrid. When much handled it is apt to cause redness, swelling, and vesication of the skin. The following is an illustrative case from Buchner (*Toxikologie*, 265):—After some very hot days in June 1823, Roth, an apothecary at Aschaffenburg, cut down a considerable quantity of rue while in full bloom, and separated the leaves from the stalks. The next morning both his hands were very red and hot, and, on the third day, appeared as if they had been exposed to hot aqueous vapour. They were besmeared with oil. Towards evening vesication commenced, and was most copious at the points of the fingers. On the fourth day the parts were still much swollen; and between the blisters the skin had assumed a dark red or purplish hue. On the fifth and sixth days the swelling extended up the back part of the arms as far as the elbow. Poultices (of chamomile and elder flowers) were applied, and the blisters cut. Within four weeks the skin had gradually peeled off. His children, who had played with the rue, suffered with swelling of the face and hands.

The constitutional effects of rue are those of a stimulant and narcotic. It has long been celebrated as an antispasmodic in epilepsy, hysteria, and flatulent colic. It is a very popular emmenagogue, especially in hysterical cases, and is sometimes resorted to for the purpose of procuring abortion. Its narcotic and reputed uterine influence seems to be proved by three cases of poisoning with it, taken for the purpose of causing miscarriage, published by Helie (*Lond. Med. Gaz.* vol. xxiv. p. 171). In these cases the rue produced the effects of an acro-narcotic poison—viz. epigastric pain, violent and continued vomiting, inflammation and swelling of the tongue, salivation, colic, fever, thirst, disorder of the muscular system (manifested by tottering gait, and irregular and convulsive movements of the body and limbs), giddiness, confused vision, contracted pupil, delirium, or rather reverie, somnolency, and, after some days, miscarriage. During the stupor the pulse was feeble, very small, and slow (in one case beating only thirty times in the minute); there were great debility, faintness, and coldness of the skin. The general appearance was that of an intoxicated person. The ill effects lasted several days. In one case a decoction of three fresh sliced roots, as big as the finger, had been taken; in the second, a decoction of the leaves; in the third, a large dose of the expressed juice of the fresh leaves.

USES.—Rue is comparatively but little employed by the medical practitioner. It formerly enjoyed great celebrity as an antispasmodic and emmenagogue; a celebrity which it still retains among the public. The observations above made on the effects of rue prove that it is a much more active agent than is commonly supposed, and its remedial powers deserve to be more carefully examined than they have hitherto been. *In the flatulent colic*, especially of children, it is an exceedingly valuable remedy, and may be administered either by the stomach or, in infants, by the rectum, in the form of clyster. It may also be employed with benefit in some cases of *infantile convulsions*. It has been employed in *hysteria, amenorrhœa*, and *epilepsy*. In the two first of these maladies it will probably at times prove serviceable, and in them it deserves further trials. It has likewise been used as an *anthelmintic*. In former times it was eaten as a *condiment*, and was regarded as an universal *antidote* to poisons. It has been employed topically as an *antiseptic* in gangrene and foul ulcers, and likewise as a *local stimulant, rubefacient*, and *discutient*, in cold swellings, contusions, &c.

ADMINISTRATION.—Dose of the *powder* from ℈j. to ʒss.; but this is not an eligible mode of preparation, as rue loses part of its activity (by the volatilization of its essential oil) by drying. An *infusion* (prepared by digesting an ounce of the fresh herb in Oj. of boiling water), called *rue tea*, is a popular remedy. It is given in doses of f℥j. to f℥ij. *Rue water* (*aqua rutæ*) may be prepared with the oil, as *mint water* (see p. 828): its dose is f℥j. to f℥ij.

1. CONFECTIO RUTÆ, L. *Conserva Rutæ*, D. (Rue, dried; Caraway; Bay Berries, of each, ℥jss.; Sagapenum, ʒss.; Black Pepper, ʒij.; Clarified Honey, ℥xvj. Rub the dry ingredients into a very fine powder. The *London College* directs the honey not to be added until the confection is to be used: the *Dublin College*, however, mixes it with the dry ingredients at once).—Carminative and antispasmodic. Employed in flatulent colic and infantile convulsions. Objectionable in inflammation of the intestinal mucous membrane. Dose ℈j. to ʒj. Sometimes employed in the maladies of children in the form of enema, composed of gruel and a scruple of the confection.

2. OLEUM RUTÆ, D. E. (Obtained by submitting the herb, with water, to distillation). From 12 lbs. of the leaves, gathered before the plant had flowered, Lewis (*Mat. Med.*) obtained only about ʒiij. of oil; but the same quantity of herb, with the seeds almost ripe, yielded above ℥j.—It is stimulant, antispasmodic, and emmenagogue. Used in spasmodic and convulsive diseases, and in amenorrhœa. Dose, gtt. ij. to vj., rubbed down with sugar and water.

3. SYRUPUS RUTÆ.—Though syrup of rue is not contained in any of the British pharmacopœias, it is a useful preparation, and is always kept in the shops. It is usually prepared extemporaneously by adding eight or ten drops of the oil to a pint of simple syrup. It is used by nurses to relieve the flatulent colic of children. Dose, one or two teaspoonfuls.

4. EXTRACTUM RUTÆ, D. (A watery extract).—A very useless preparation. The volatile oil, on which the stimulant and antispasmodic

properties of the herb depends, is driven off in the process, leaving the bitter extractive. It is tonic, but inferior to extract of chamomile. Dose, grs. x. to ℈j.

Baros'ma, Willdenow.—*Various Species,* E.

Dios'ma crena'ta, *Dec. L. D.*

Sex. Syst. Pentandria, Monogynia.

(Folia, *L. D.*—Leaves, *E.*)

History.—The natives of the Cape of Good Hope employ several species of Barosma, on account of their odoriferous and medicinal properties. The Hottentots employ a powder, composed of the leaves of various odoriferous plants (principally Barosmas), under the name of *Bookoo* or *Buku*, for anointing their bodies (Burchell, *Travels in Southern Africa*, vol. i. p. 479, and vol. ii. p. 59). Barosma crenata was introduced into the botanical gardens of this country in 1774, but it was not employed in medicine until 1823.

Botany. *Gen. Char.*—*Calyx* five-cleft or parted; dotted. *Disk* lining the bottom of the calyx, generally with a short, scarcely prominent, rim. *Petals* five, with short claws. *Filaments* ten; the five opposite the petals sterile, petaloid, sessile, ciliated, obscurely glandular at the apex; the other five longer, smooth or hispid, subulate, with the anthers usually furnished with a minute gland at the apex. *Style* as long as the petals. *Stigma* minute, five-lobed; *ovaries* auriculate at the apex, usually glandular and tuberculated. *Fruit* composed of five cocci covered with glandular dots at the back (*Lindley*).—*Shrubs: Leaves* opposite, flat, smooth, dotted. *Flowers* stalked, axillary.

Species. — The leaves of several species of Barosma constitute *Buchu* or *Bucku.*

1. Baros'ma crenula'ta, *Willd.*; *Diosma crenulata, Linn.*; D. odorata, *Decandolle*; D. latifolia, *Loddiges*; D. serratifolia, *Burchell.* — *Leaves* ovate-oblong, crenate, smooth, glandular. *Pedicels* solitary, with two bracts immediately under the flower (*Dec.*)—Upright *shrub*, between two and three feet in height; branches brownish-purple. *Leaves* about an inch long, oval-lanceolate, on very short petioles, very obtuse, delicately and minutely crenated, quite glabrous, rigid, darkish-green, and quite smooth above, with a few very obscure oblique nerves, beneath paler, dotted with glands which are scarcely pellucid, while at every crenature is a conspicuous pellucid gland: there is also a narrow pellucid margin round the whole leaf. *Peduncles* about as long as the leaf. *Calyx* of five ovate-acuminate leaflets, green, tinged with purple. *Corolla* of five ovate petals, purple in bud, blush-coloured when fully expanded.—(Condensed from Hooker, *Bot. Mag.* t. 3413).—Cape of Good Hope.

2. Baros'ma crena'ta, *Ecklon and Zeyher, Enum. Pl. Afr. austr.* i. 102, 1805; Dios'ma crena'ta, *Decandolle*, *Loddiges*, L. D.—*Leaves* ovate [or obovate] acute, dotted, glandulose-serrate at the margin. *Pedicels* solitary, somewhat leafy (*Decand.*)—*Flowers* pink, terminal, on short leafy branches.—Cape of Good Hope.

3. Baros'ma serratifo'lia, Willd., Decandolle, Loddiges.—*Leaves* linear-lanceolate, serrulate, smooth, glandular. *Pedicels* solitary, bearing two leaflets above the middle (*Decand.*)—*Leaves* acuminate, three-nerved. *Flowers* lateral, white.—Cape of Good Hope.

Description.—The leaves of several species of Barosma are known in the shops as *Buchu* (*Bucku*, E.; *Folia Barosmæ* seu *Diosmæ*). They are intermixed with stalks and fruit. They are smooth, somewhat shining, sharply or bluntly serrated or crenated, and beset both on the edges, especially between the teeth, and on the under surface, with glands filled with essential oil. Their consistence is coriaceous; their colour pale or yellowish-green; their odour strong and rue-like (though some compare it to rosemary, others to cumin, or cat's urine), and their taste is warm and mint-like. They present considerable variety in shape. The most common are the following:—

a. Ovate or *obovate Buchu. Leaves of Barosma crenata*, Eckl. and Zeyhar.—Leaves ovate, oval, oblong, or obovate.

b. Ovate-oblong Buchu. Leaves of Barosma crenulata, Willd.—Leaves ovate-oblong or obovate-oblong or oval-lanceolate, obtuse.

c. Linear-lanceolate Buchu. Leaves of Barosma serratifolia, Willd.—Leaves linear-lanceolate or lanceolate, acuminate.

Composition.—Two analyses of buchu have been made: one, in 1827, by Brandes (Gmelin, *Handb. de Chem.* ii. 1258); the other, in the same year, by Cadet de Gassicourt (*Journ. de Chim. Méd.* iii. 44).

Brandes's Analysis.

Pale yellow volatile oil	0·88
Resin	2·34
Bitter extractive (*Diosmin*)	3·78
Chlorophylle	4·77
Gum	12·71
Lignin	45·00
Brown substance extracted by potash	1·56
Nitrogenous matter extracted by potash	2·42
Albumen	0·58
Malic acid, and matter precipitable by tannin	1·56
Bassorin, with oxalate and phosphate of lime	4·53
Various salts of potash and lime	3·07
Water	12·94
Acetic acid and loss	3·86
Leaves of Diosma crenata	100·00

Cadet's Analysis.

Volatile oil	0·665
Gum	21·170
Extractive	5·170
Chlorophylle	1·100
Resin	2·151
[Lignin, &c.	69·744]
Leaves of Diosma crenata	100·000

1. *Volatite Oil of Buchu* (*Oleum Barosmæ* seu *Diosmæ*).—Yellowish-brown, lighter than water; odour that of the leaves.

2. *Bitter Extractive: Diosmin.*—Brownish-yellow, bitter and somewhat pungent. Soluble in water, but neither in alcohol or ether.

Physiological Effects.—Buchu is an aromatic stimulant and tonic. Taken in moderate doses it promotes the appetite, relieves nausea and flatulence, and acts as a diuretic and diaphoretic. Its constitutional effects appear referrible—first, to its action on the stomach; and, secondly, to the absorption of the volatile oil, which is subsequently thrown out of the system by the secreting organs, on which it appears to act topically in its passage through them. Buchu seems to have a specific influence over the urinary organs.

Uses.—The natives of the Cape of Good Hope prepare a spirit of buchu (which they term *buchu brandy*), by distilling the leaves with the dregs of wine, which they employ in chronic diseases of the stomach and bladder.

In this country buchu has been principally employed *in chronic maladies of the urino-genital organs.* Dr. Reece (*Gaz. of Health* for 1821, 1822, 1823, and 1824) first drew the attention of practitioners and the public in this country to it in these cases; and, in 1823, Dr. M'Dowell (*Trans. of the King and Queen's Coll. of Phys.* vol. iv. p. 131, Dubl. 1824) gave a most favourable account of its good effects. It has since been employed by a considerable number of practitioners, and its remedial powers fairly tried. It seems to be principally adapted to chronic cases attended with copious secretion. *In chronic inflammation of the mucous membrane of the bladder,* attended with a copious discharge of mucus, it frequently checks the secretion, and diminishes the irritable condition of the bladder, thereby enabling the patient to retain his urine for a longer period; but I have several times seen it fail to give the least relief, and in some cases it appeared rather to add to the patient's sufferings. *In irritable conditions of the urethra,* as spasmodic stricture, and *in gleet,* it has occasionally proved serviceable. In *lithiasis,* attended with increased secretion of uric acid, it has been given with considerable benefit by Dr. Carter (*Lond. Med. Rep.* Apr. 1826, p. 348), and others, and has appeared to check the formation of this acid. For the most part it should be given in these cases in combination with alkalies (as liquor potassæ). In *prostatic affections, in rheumatism,* and even *in skin diseases,* it has also been employed; and, it is said, with occasional good effect. In *dyspepsia* Dr. Hulton has found it serviceable (M'Dowell, *op. cit.*)

Administration.—The dose of buchu, *in powder,* is ℈j. or ʒss. It is usually taken in wine. But the *infusion* and *tincture* are more eligible preparations.

1. *Infusum Buchu,* D. *Infusum Bucku,* E. *Infusum Diosmæ,* L. (Buchu, ℥j. [ʒss. *D.*]; Boiling [distilled, *L.*] Water, Oj. [Oss. *D.*] Macerate for four [two, *E.*] hours in a lightly-covered vessel, and strain [through linen, *D. E.*, or calico, *E.*] —Tonic, sudorific, and diuretic. Dose, f℥j. to f℥ij.

2. *Tinctura Buchu,* D. *Tinctura Bucku,* E. (Buchu, ℥iiss.; Proof Spirit, Oj. Digest for seven days, pour off the clear liquor, and filter it. This tincture may be conveniently and quickly made also by the process of percolation, *E.*—The proportions used by the *Dublin College* are essentially the same, and the tincture is directed to be prepared by maceration).—Dose, fʒj. to fʒiv.

Galipe'a officina'lis, Hancock, E. and *G. Cuspa'ria,* Decandolle, L.

Bonplan'dia trifolia'ta, *Willd. D.*

Sex. Syst. Diandria, Monogynia.

(Cortex, *L. D.*—Bark, *E.*)

History.—Mutis is said to have employed angostura bark in 1759; but it did not come to England until 1788, and was first publicly noticed in the *London Medical Journal* for 1789. Mr. A. E. Brande (*Exp. and Observ. on the Angustura Bark,* Lond. 1793) says, that, in 1791, 40,000 lbs. or upwards had been imported. It was called *Cortex Angusturæ,* from Angostura, a place in South America, whence the Spaniards first brought it.

Botany. *Gen. Char.*—*Calyx* short, five-toothed. *Petals* five, united into a salver-shaped corolla, or closely approximating; tube short, pentagonal; lobes spreading, acute. *Stamens* four to seven, hypogynous, somewhat adherent to the petals, unequal, sometimes all fertile, commonly two antheriferous, two to five shorter, sterile. *Nectary* cupuliform. *Styles* five, afterwards combined into one, and forming a four- or five-grooved *stigma*. *Carpella* five, or by abortion fewer, containing two ovules, obtuse, cocculiform, sessile, with a separable endocarp. *Seeds* solitary by abortion; *cotyledons* large, corrugated, biauriculate.—Smooth *shrubs*. *Leaves* alternate, simple, or plurifoliate; leaflets oblong, acuminate. *Peduncles* axillary, many flowered (D. C.)

Species.—Humboldt and Bonpland (*Pl. Æquinoct.* ii. 59, t. 57) state that *Galipea Cusparia*, Dec. yields Angostura bark; whereas Dr. Hancock (*Trans. Med. Bot. Soc.* 1829, p. 16) asserts that it is a species which he calls *Galipea officinalis*. But it appears to me not improbable that both species may yield a febrifuge bark.

1. Galipe'a Cuspa'ria, *Decand. L.* Bonplandia trifoliata, *Willd. D.* Cusparia febrifuga, *Humb. and Bonpl.* — *Leaves* trifoliate. *Racemes* stalked, almost terminal. *Calyx* five-toothed. *Sterile stamens* three (*Decand.*)—A majestic forest *tree*, sixty or eighty feet high. *Leaves* two feet long, gratefully fragrant; petioles one foot long, or nearly so; leaflets sessile, unequal, ovate-lanceolate, acute. *Flowers* white, with fascicles of hairs seated on glandular bodies on the outside. *Stamens* monadelphous (Kunth); fertile ones, two; sterile ones, three, according to Roemer—four, according to Kunth; *anthers* with two short appendages. *Stigmas* five. *Seed* solitary.—Forests of tropical America. Yields *Angostura bark* (Humboldt and Bonpland).

2. Galipe'a officina'lis, *Hancock, E.*—*Leaves* trifoliate. *Racemes* stalked, axillary, terminal. *Stamens* two. *Nectaries* (sterile stamens?) five (*Hancock*).—A *tree*, usually twelve or fifteen feet high, never exceeding twenty feet. *Leaves*, when fresh, having the odour of tobacco; leaflets oblong, pointed at both extremities, from six to ten inches long, on very short stalks; petioles as long as the leaflets. *Flowers* white, hairy. *Stamens* distinct; fertile ones, two; sterile ones, five; *anthers* without appendages. *Stigma* simple, capitate. *Seeds* two in each capsule; one usually abortive. Neighbourhood of the Orinoko (Carony, Alta Gracia, &c.) Yields *Angostura* or *Carony bark* (Hancock).

Description.—Angostura or Cusparia bark (*cortex angosturæ seu cuspariæ*) is imported directly or indirectly from South America. "The most of what I have seen," says Mr. A. E. Brande, "has been put into casks in the West Indies; but where the original package remains it is very curious, and formed carefully of the large leaves of a species of palm, surrounded by a kind of net-work made of flexible sticks." It occurs in flat pieces and quills, of various sizes, the longest pieces being from six to ten inches in length, covered with a yellowish-grey or greyish-white spongy epidermis, easily scraped off by the nail. The internal surface is brownish, not quite smooth, somewhat fibrous or splintery, easily separable into laminæ; the fracture is short and resinous; the odour strong but peculiar, and somewhat animal; the taste bitter, aromatic, and slightly acrid.

Substitution.—I have already (see p. 906-7-10) noticed the serious accidents which have resulted in consequence of the bark of the nux-vomica tree being substituted, either from ignorance or commercial cupidity, with angostura bark. Hence arose the distinction into *true* or *West Indian angostura*, and *false*, *spurious*, or *East Indian angostura*. Though the characters of the latter have been fully described (see p. 906-7), it may be as well to place them in contrast with those of the genuine angostura. In drawing up the following table of characteristics, I have been greatly assisted by the tables of Guibourt (*Hist. des Drog.* ii. 6. 3me éd.) and Fée (*Cours d'Hist. Nat. Pharm.* i. 588).

		Angostura Bark.	*Nux Vomica (False Angostura) Bark.*
Form		Quills or flat pieces, straight or slightly bent.	Quills or flat pieces, short, often very much twisted like dried horn, arched backwards.
Odour		Disagreeable.	None, or very slight.
Taste		Bitter, afterwards somewhat acrid, persistent.	Intensely bitter, very persistent.
Hardness and Density		Bark fragile when dry, easily cut, light, tissue not very dense.	Broken or cut with difficulty, heavy, tissue compact.
Fracture		Dull and blackish.	Resinous.
Epidermoid crust		Whitish or yellowish, insipid, unchanged, or rendered slightly orange-red by nitric acid.	Variable: sometimes a spongy rust-coloured layer; at other times whitish, prominent spots, more or less scattered or approximated. Nitric acid makes it intensely dark green or blackish.
Inner surface		Separable into laminæ; deepened by nitric acid.	Not separable into laminæ; rendered blood red by nitric acid.
Infusion of the bark prepared by digesting one part of bark in 24 parts of water.	*Tinct. of Litmus*	Blue colour destroyed.	Slightly reddened.
	Sesquichl. Iron.	Flocculent dark greyish-brown precipitate.	Clear yellowish-green liquor.
	Ferrocyanide of Potassium	No change: hydrochloric acid caused a yellow precipitate.	Slight turbidness not augmented by hydrochloric acid; liquor greenish.
	Nitric Acid	A small quantity makes the liquor cloudy; a large quantity renders it transparent deep red.	A small quantity makes the liquor clear and paler; a large quantity transparent red.

Composition.—Angostura bark has been the subject of repeated chemical investigation. Notices of the earlier attempts to analyse it are given by Meyer (*Diss. Inaug. de Cort. Angust.* Gotting. 1790) and by Pfaff (*Syst. der Mat. Med.* ii. 58). The analyses which deserve quoting are those of Pfaff (*Ibid.*) and Fischer (Gmelin, *Hand. d. Chem.* ii. 1258).

Pfaff's Analysis.	*Fischer's Analysis.*	
Volatile oil.	Volatile oil	0·3
Bitter extractive.	Peculiar bitter principle	3·7
Bitter resin.	Bitter hard resin	1·7
Acrid oily resin.	Balsamic soft resin	1·9
Tartaric acid (free).	Elastic resin	0·2
Salts (sulphate and tartrate of potash, chloride of potassium, and sulphate of lime).	Gum	5·7
Lignin.	Lignin	89·1
Angostura bark.	Angostura bark	102·6

1. *Volatile Oil of Angostura; Odorous Principle of Angostura.*—Obtained by submitting the bark to distillation with water. It is yellowish-white, lighter than water, has the peculiar odour of the bark, and an acrid taste. To this, as well as to the resin,

the bark owes its acrid, aromatic taste (Pfaff, *op. supra cit.* Bd. ii. 61 and 69; Bd. vi. 191).

2. *Angosturin; Cusparin*, Saladin; *Bitter Extractive*, Pfaff; *Peculiar Bitter Principle.*—A neutral principle obtained by Saladin (*Journ. de Chim. Méd.* ix. 388) in the form of tetrahedral crystals, by submitting the alcoholic tincture of the bark (prepared without heat) to spontaneous evaporation. When heated it fuses, loses 23·09 per cent. of its weight, and subsequently inflames, without giving any evidence of its being volatile or nitrogenous. It is insoluble in the volatile oils and in ether; but dissolves slightly in water, more so in alcohol. Alkaline solutions also dissolve it. Nitric acid renders it greenish-yellow; sulphuric acid reddish-brown. Tincture of nutgalls precipitates it from its aqueous and alcoholic solutions.

3. *Resin.*—The *hard* resin brown, bitter, soluble in potash, alcohol, and acetic ether; but insoluble in sulphuric ether and oil of turpentine. The *soft resin* is acrid, greenish-yellow, soluble in alcohol, ether, oil of turpentine, and almond oil; but insoluble in a solution of potash. It is coloured red by nitric acid (Pfaff, *op. supra cit.* vi. 191).

Physiological Effects.—A powerful aromatic or stimulant tonic (see the effects of the *aromatic bitters*, p. 80). Its aromatic or stimulant properties depend on the volatile oil and resin; its tonic operation on the bitter principle. In its tonic and febrifuge powers it approximates to cinchona bark, but is devoid of astringency. It is less likely to irritate the stomach or to cause constipation than cinchona; but usually keeps the bowels gently open. In full doses it is capable of nauseating and purging. Dr. Hancock says the warm infusion causes sweating and diuresis. In its combination of tonic and aromatic properties, it is most allied to cascarilla. In its stomachic qualities it approaches calumba.

Uses.—Angostura bark is but little employed by practitioners of this country. We may fairly ascribe this in part to the serious consequences which have resulted from the use of the false angostura, and in part to the belief that we have other remedies of equal, if not of superior, efficacy to it. In some of the continental states, its employment has been prohibited (see p. 907). It may be administered as a febrifuge *in intermittents and remittents*, especially in the worst forms of the bilious remittents of tropical climates. Dr. Williams (*Lond. Med. and Phys. Journ.* 1798, part ii. p. 158), Wilkinson (*Ibid.* 1790, part iv. p. 331), Winterbottom (*Med. Facts and Obs.* vol. vii. p. 41), and, more recently, Dr. Hancock, have spoken in the highest terms of its efficacy. In some of these cases it is said to have proved greatly superior to cinchona. It sits more readily on the stomach, and does not cause constipation like the latter, but keeps the bowels gently open. *In adynamic continued fever*, especially when complicated with great disorder of the digestive organs (manifested by vomiting or purging), it has been used with good effect (Winterbottom; also Lettsom, *Mem. of the Med. Soc. of Lond.* vol. iv. p. 191). As an aromatic tonic and stomachic, *in general relaxation and muscular debility*, and *in atonic conditions of the stomach and intestinal tube* (as some forms of dyspepsia, anorexia, &c.), it has been employed with great success. It has also been administered *to check profuse mucous discharges*. Thus in the latter stages and chronic forms of dysentery and diarrhœa, and in chronic bronchial affections attended with excessive secretion of mucus. In fine, angostura is applicable to any of the purposes for which other vegetable tonics (especially cascarilla, calumba, and cinchona) are commonly employed.

Administration.—It may be given *in powder* in doses of from grs. x. to ʒss. But the *infusion* and *tincture* are more elegant preparations.

1. *Infusum Cuspariæ*, L. E. *Infusum Angusturæ*, D. (Cusparia, bruised, ℥v. [℥ij. *D.*]; Boiling [distilled, *L.*] Water, Oj. [Oss. wine measure, *D.*] Macerate for two hours in a lightly covered vessel, and strain [through linen or calico, *E.*])—Tonic, stomachic, and stimulant. Used in low fever, bilious diarrhœas and dysenteries, muscular debility, dyspepsia, &c. Dose f℥j. to f℥ij. Tincture of cinnamon is an agreeable addition to it.

2. *Tinctura Cuspariæ*, E. *Tinctura Angusturæ*, D. (Cusparia, in moderately fine powder, ℥ij. and ʒij. [℥ij. *D.*]; Proof Spirit, Oj. [Oij. wine measure, *D.*] Macerate for fourteen days and filter, *D.*—This tincture is to be made like the tincture of cinchona, and most expeditiously by the process of percolation, *E.*) Tonic, stimulant, and stomachic. Generally employed as an adjunct to bitter infusions. Dose f℥j. to f℥ij.

Other Medicinal Rutaceæ.

The root of *Dictamm'nus Fraxinel'la*, or *Bastard Dittany*, was formerly employed in medicine, but of late years has fallen into almost total disuse. There are two varieties of this plant: *α. purpurea* with purple flowers; and *β. alba* with white flowers. It is a native of the South of Europe. The root contains *volatile oil, resin, bitter extractive,* and probably *gum.* It is an aromatic tonic, and is reputed to possess antispasmodic, diuretic, and emmenagogue properties. It was formerly employed in intermittents, epilepsy, hysteria, amenorrhœa, chlorosis, and worms. The dose of it is from ℈j. to ʒj. Attention has been recently drawn to it by Dr. Aldis (*Lond. Med. Gaz.* vol. xix. p. 142), who states that it has been employed, during forty years, with great success, in the cure of epilepsy, by Baron A. Sloet van Oldruitenborgh and family (see *Lond. Med. and Phys. Journ.* vol. xlvi. p. 605). I am acquainted with one patient (a young lady) who took it for six months without receiving any ultimate benefit from it.

Order 63. Zygophylla'ceæ, *Lindley.*—The Bean Caper Tribe.

Zygophylleæ.—*R. Brown.*

Essential Character.—*Sepals* five, distinct, or scarcely coherent at the base. *Petals* five, alternate with the sepals, inserted on the receptacle. *Stamens* ten, distinct, hypogynous, five opposite to the sepals, and five to the petals. *Ovary* single, five-celled; *styles* five united into one, sometimes rather distinct at the apex. *Capsule* of five carpels, which are more or less adnate to each other and to the central axis; cells dehiscent at the superior angle, usually many-seeded, or one-seeded, neither cocculiferous nor arilliferous. *Seeds* albuminous, or commonly exalbuminous; *embryo* straight; *radicle* superior; *cotyledons* foliaceous.—*Herbs, shrubs,* or *trees. Leaves* with stipules at the base, usually compound. (*D. C.*)

Properties.—The Guaiacums are resinous, and possess stimulant properties.

Guai'acum officinale, Linn. L. D.—*Officinal Guaiacum.*

Sex. Syst. Decandria, Monogynia.

(Lignum. Resina, *L. D.*—Wood. Resin obtained by heat from the wood, *E.*)

History.—The Spaniards derived their knowledge of the medical uses of Guaiacum from the natives of St. Domingo, and introduced this remedy into Europe in the early part of the sixteenth century (about 1508.) The first importer of it was Gonsalvo Ferrand, who, being infected with the venereal disease, and not obtaining any cure for it in

Europe, went to the West Indies to ascertain how the natives in that part of the world treated themselves, as the disease was as common with them as small-pox with Europeans. Having ascertained that Guaiacum was employed, he returned to Spain, and commenced practitioner himself. "I suppose," says Freind (*Hist. of Physick*, part ii. p. 365, 2nd ed.) "he might make a monopoly of it; for it appears that some time after it was sold for seven gold crowns a pound."

BOTANY. *Gen. Char.*—*Calyx* five-partite, obtuse. *Petals* five. *Stamens* ten; *filaments* naked, or somewhat appendiculate. *Style* and *stigma* one. *Capsule* somewhat stalked, five-celled, five-angled, or by abortion two- or three-celled. *Seeds* solitary in the cells, affixed to the axis, pendulous; *albumen* cartilaginous, with small chinks; *cotyledons* somewhat thick.—*Trees* with a hard wood. *Leaves* abruptly pinnate. *Peduncles* axillary, one-flowered (D. C.)

Sp. Char.—*Leaves* bijugate: *leaflets* obovate or oval, obtuse (D. C.)

A *tree* rising thirty or forty feet high. *Stem* commonly crooked; bark furrowed; wood very hard and heavy. *Leaves* evergreen. *Flowers* six to ten in the axillæ of the upper leaves. *Peduncles* an inch or an inch and a half long, unifloral. *Sepals* five, oval. *Petals* five, oblong or somewhat wedge-shaped, pale blue. *Stamens* somewhat shorter than the petals. *Ovary* compressed, two-celled; *style* short, pointed. *Capsule* obovate, coriaceous, yellow.

Hab.—St. Domingo and Jamaica.

DESCRIPTION AND COMPOSITION.—In this country the *wood* and the *resin* only are officinal; but on the continent the *bark* also is used. They are imported from St. Domingo.

1. *Guaiacum Wood* (*Lignum Guaiaci*). This is commonly termed *lignum vitæ*.—It is imported in large logs or billets, and is extensively used for making pestles, rulers, skittle-balls, and various other articles of turnery ware. On examining the transverse sections of these stems, hardly any traces of medulla or pith are observable, while the annual or concentric layers or zones are extremely indistinct. The wood is remarkable, says Dr. Lindley (*Nat. Syst. of Bot.* p. 134, 2nd ed.), "for the direction of its fibres, each layer of which crosses the preceding diagonally; a circumstance first pointed out to me by Professor Voigt." This fact, however, was noticed by Brown (*Nat. Hist. of Jam.* p. 226) above fifty years ago. The distinction between the young and the old wood is very remarkable. The young wood (called *alburnum* or *sapwood*) is of a pale yellow colour; while the old wood (called *duramen* or *heartwood*) which forms the central and principal part of the stem is of a greenish brown colour, in consequence of the deposition of resinous matter, first in the ducts and subsequently in all parts of the tissue. By boiling a thin shaving of the wood in nitric acid, the whole of the deposited matter is destroyed, and the tissue restored to its original colourless character.

Shavings, turnings, or *raspings of guaiacum* (*lignum guaiaci raspatum* seu *rasum*; *rasura* vel *scobs guaiaci*) are prepared by turners for the use of druggists and apothecaries. They are distinguished from the raspings of other woods by nitric acid, which communicates to them a temporary bluish-green colour. A decoction of the shavings is yellowish, and does not change colour in the air, and very little even by nitric acid, though after some time it becomes turbid. Neither a solution of emetic tartar nor the tincture of nutgalls cause any precipitate. The ferruginous salts deepen its colour.

Trommsdorf (*Journ. de Chim. Méd.* vii. 430) analyzed the wood, and found it to consist of *resin* 26·0, *bitter, piquant extractive* 0·8, *mucous extractive with a vegetable salt of lime* 2·8, *colouring matter* (?) similar to that of the bark 1·0, and *woody fibre* 69·4.

Guaiacum bark (*Cortex Guaiaci*) is gray, compact, very hard, heavy, and resinous. Its internal surface sometimes presents numerous, small, brilliant, apparently crystalline points, which Guibourt supposes to be benzoic acid. Trommsdorf (*Journ. de Chim. Méd.* vii. 429) analyzed this bark, and found it to consist of the following substances: —*peculiar resin* different from that of the wood 2·3, *peculiar, bitter, piquant extractive* precipitable by acids 48, *gum* 0·8, *brownish yellow colouring matter,* 4·1, *mucous extractive with sulphate of lime,* 12·0, and *lignin* 76·0.

2. *Guaiacum Resin* (*Resina Guaiaci*). This is commonly, though very erroneously, denominated *gum guaiacum*. It is obtained from the stem of the tree by the following methods:—

a. By natural exudation.—It exudes naturally from the stem, and may be seen on it at all seasons of the year (Brown, *op. supra cit.* p. 226). *b. By jagging.*—If the tree be wounded in different parts, a copious exudation takes place from the wounds, which hardens by exposure to the sun. This operation is performed in May. *c. By heat.*—Another method of obtaining it is the following:—"The trunk and larger limbs being sawn into billets of about three feet long, an auger hole is bored lengthwise in each, and one end of the billet so placed on a fire that a calabash may receive the melted resin which runs through the hole as the wood burns."—(Wright, *Med. Plants of Jamaica*). *d. By boiling.*—It is also obtained in small quantities by boiling chips or sawings of the wood in water with common salt. The resin swims at the top, and may be skimmed off (Wright, *op. supra cit.*) The salt is used to raise the boiling point of the water.

Guaiacum occurs in tears and in masses. *Guaiacum in tears* (*Guaiacum in lachrymis*) occurs in rounded or oval tears, of varying size, some being larger than a walnut. Externally they are covered by a greyish dust. They are said to be produced by *Guaiacum sanctum* (*Journ. de Pharm.* xx. 520). *Lump Guaiacum* (*Guaiacum in massis*) is the ordinary kind met with in the shops. These masses are of considerable size, and are ordinarily mixed with pieces of bark, wood, and other impurities; they are of a brownish, or greenish brown colour, and have a brilliant, shiny, resinous fracture. Thin laminæ are nearly transparent, and have a yellowish green colour. The odour is balsamic, but very slight, though becoming more sensible by pulverization. When chewed, guaiacum softens under the teeth, but has scarcely any taste, though it leaves a burning sensation in the throat. Its specific gravity is 1.2289. When heated guaiacum melts and evolves a fragrant odour. The products of the destructive distillation of guaiacum have been examined both by Mr. Brande and Unverdorben. Among the new substances obtained by the latter are *two empyreumatic oils of guaiacum* (one volatile, the other fixed) and *pyro-guaiacic acid.*

In 1805, Mr. Brande (*Phil. Trans.* for 1806, p. 89) analyzed guaiacum. In 1806 it was examined by Bucholz (quoted by Schwartze, *Pharm. Tabell.* 293, 2te Ausg.), and in 1828 by Buchner (Gmelin, *Handb. d. Chem.* ii. 571). Dr. Ure (*Dict. of Chem.*) has made an ultimate analysis of it.

Brande's Analysis.

Substance *sui generis* (guaiacum properly so called)	91
Extractive	9
Guaiacum	100

Buchner's Analysis.

Pure resin		79·8
Bark 20·1	Woody fibre	16·5
	Tasteless gum	1·5
	Extractive	2.1
Guaiacum		99·9

Ure's Analysis.

Carbon	67·88
Hydrogen	7·05
Oxygen	25·07
Guaiacum	100·00

1. *Guaiacic Acid; Guaiacin.* Is insoluble in water, but is readily dissolved by alcohol, and is precipitated from its alcoholic solution by water, sulphuric and nitric acids, and chlorine. Ether dissolves the resin, but not so readily as alcohol. Solutions of the caustic alkalies (potash and soda) dissolve it, forming *alkaline guaiacites* (*guaiacum soaps; sapones guaiacini*). The mineral acids precipitate it from its alkaline solution. Various salts (as acetate of baryta, acetate of lime, acetate of lead, nitrate of silver, and chloride of gold) occasion precipitates (*guaiacates*) with the alkaline solution. Guaiacic acid is remarkable for the changes of colour it undergoes by the influence of various agents. Thus its powder, and paper moistened with its tincture, become *green* in air or oxygen gas, but not in carbonic acid gas. This change, which seems connected with the absorption of oxygen, is influenced by the intensity and colour of the light. Various substances give a *blue* tint to guaiacum when in contact with air: thus gluten, but not starch. Hence powdered guaiacum has been proposed as a test of the goodness of wheaten flour (which contains gluten), and of the purity of starch. Gum Arabic, dissolved in cold water, has the same effect as gluten, but tragacanth gum has not. Milk, and various fresh roots and underground stems (for example, those of the horseradish, potato, carrot, colchicum, &c.), also possess this property. Certain agents change the colour of guaiacum successively to *green*, *blue*, and *brown*: thus, nitric acid and chlorine. Nitric acid colours the tincture of guaiacum green, then blue, and afterwards brown. If a piece of paper moistened with the tincture be exposed to the fumes of the acid, its colour is immediately changed to blue. Spirit of nitric ether usually gives a blue colour to tincture of guaiacum (see p. 216). Mr. Brande has conjectured, and I think with great probability, that these different coloured compounds are combinations of oxygen with guaiacum,—the green compound containing the least, the brown the most, while the blue is intermediate. Mr. Johnson (*Proceed. of the Royal Soc.* June 18, 1840) says guaiacum resin consists of $C^{40} H^{23} O^{10}$; its equivalent, therefore, is 343. According to Unverdorben the resin of guaiacum is of two kinds: *one* readily soluble in a solution of ammonia,—and another which forms with ammonia a tarry compound. Pagenstecher has shown that tincture of guaiacum with hydrocyanic acid and sulphate of copper produces an intense blue colour (see p. 241).

2. *Extractive.* This is extracted from guaiacum by the agency of water. The proportion of it present is liable to variation. It is a brown acrid substance.

These observations, then, show that guaiacum is essentially a *peculiar resin*, mechanically mixed with variable but small quantities of extractive and other impurities.

Adulteration.—Various adulterations are described as being practised on guaiacum. Though I have found this substance in the shops of this country of unequal degrees of impurity, I have never had reason to suspect that sophistication had been practised on it. The presence of resin might be suspected by the peculiar odour evolved when the suspected resin is heated. Another mode of detecting this fraud is to add water to the alcoholic solution of the suspected guaiacum, and to the milky liquid thus formed a solution of caustic potash is to be added until the liquor becomes clear. If now an excess of potash cause no precipitate, no resin is present; for while *guaiacate of potash* is soluble in water, the salt produced by the union of potash and resin is not completely so.

Physiological Effects.—1. *Of the Resin.* Guaiacum resin is an acrid stimulant. Its acridity depends in a great measure on the extractive with which the resin is mixed, or which resides in the fragments of bark contained in the resin.

Under the use of *small* and *repeated doses* of guaiacum, various constitutional diseases sometimes gradually subside, and a healthy condition of system is brought about with no other sensible effect of the remedy than perhaps the production of some dyspeptic symptoms, and a slight tendency to increased secretion. We designate this inexplicable, though not less certain, influence over the system, by the term *alterative*.

When we give guaiacum in *moderately large doses*, or to plethoric or easily-excited individuals, we observe the combined operation of an acrid and stimulant. The local symptoms are, the dryness of the mouth, the sensation of heat at the stomach, nausea, loss of appetite, and a relaxed condition of bowels. The stimulant operation is observed partly in the vascular system, but principally in the exhaling and secreting organs, especially the skin and kidneys. Dr. Cullen justly observes that it seems to stimulate the exhalents more in proportion than it does the heart and great arteries. If diluents be exhibited, and the skin kept warm, guaiacum acts as a powerful sudorific; whereas, when the surface is kept cool, perspiration is checked, and diuresis promoted. By continued use it has caused a mild salivation (Burdach, *Syst. d. Arzneim.* Bd. ii. S. 283.)

The stimulant influence of guaiacum is extended to the pelvic vessels, and thus the hemorrhoidal and menstrual discharges are somewhat promoted by it. But there is no reason for supposing that the pelvic organs are specifically affected by it. In *very large doses* guaiacum causes heat and burning in the throat and stomach, vomiting, purging, pyrexia, and headache.

In its operation on the system guaiacum is allied to the balsams (see pp. 74 and 398). Dr. Cullen considered its resinous part to be very analogous to the balsams and turpentines.

2. Of the Wood.—The operation of the wood is similar to, though milder than, that of the resin. Any activity which the wood communicates to boiling water must depend on the extractive, as the resin is not soluble in this fluid.

Pearson (*Observ. on the Effects of various articles of the Mat. Med.* p. 8. Lond. 1800) says, that the decoction excites a sensation of warmth in the stomach, produces dryness of the mouth, with thirst, increases the natural temperature of the skin, renders the pulse more frequent, and, if the patient lie in bed and take the decoction warm, it proves moderately sudorific; but if he be exposed freely to the air, it acts as a diuretic. Continued use occasions heartburn, flatulence, and costiveness. Kraus (*Heilmittellehre*, 612) mentions a measle-like eruption over the whole body, as being produced by large doses of the wood.

3. Of the Bark.—The bark acts in a similar way to the wood. Regnandot (Wibmer, *Wirk. d. Arzn. ü. Gifte.* Bd. ii. S. 411) injected, at eight in the morning, three ounces of an aqueous infusion of it into the veins of a young man of twenty years of age. In half an hour a shivering fit came on, with colicky pains, followed by two stools; this shivering remained till five o'clock in the evening.

Uses.—In the employment of guaiacum the acrid and stimulant properties of this resin are to be remembered. The first unfits it for use in cases of impaired digestion, where there is irritation or great susceptibility of, or inflammatory tendency in, the alimentary canal: the second renders it improper in plethoric individuals, in all states of excitement or acute inflammation, and in persons whose vascular system is easily excited, and who are disposed to hemorrhages. It is admissible and useful, on the other hand, in atonic or chronic forms of disease, with retained secretions, expecially in relaxed and phlegmatic constitutions.

The following are some of the diseases in which it has been employed:—

1. *In chronic rheumatism*, especially when occurring in scrofulous subjects, or in persons affected with venereal disease, guaiacum may be administered with considerable advantage under the conditions before mentioned. In cases of great debility, with coldness of surface, and in old persons, the ammoniated tincture may be employed.

2. *In gout.*—As a preventive of gout it was introduced by Mr. Emerigon, of Martinico (*Journ. de Méd.* t. xlvii. p. 424). His remedy (the *specificum antipodagricum Emerigonis*, as our German brethren term it) consisted of two ounces of guaiacum digested for eight days in three pints avoirdupois of rum. The dose was a tablespoonful, taken every morning fasting for a twelvemonth. Its stimulant qualities render it inadmissible during a paroxysm of gout; and with regard to its use in the interval, it is, of course, adapted for chronic atonic conditions only.

3. *In chronic skin diseases*, where sudorifics and stimulants are indicated, guaiacum may be serviceable, especially in scrofulous and syphilitic subjects.

4. *In obstructed and painful menstruation* not arising from any plethoric, inflammatory, or congested state of system, the volatile tincture of guaiacum has been employed with advantage. Dr. Dewees (*Treat. on the Diseases of Females*, p. 81, 2nd ed. 1828) states he has long been in the habit of employing it in painful menstruation with good effect. Drs. Macleod and Jewell have also borne testimony to its emmenagogue qualities.

5. *As a remedy for venereal diseases*, guaiacum wood was at one time in the greatest repute. Nicholas Poll (quoted by Pearson, *op. supra cit.*) tells us, that within nine years from the time of its introduction into Europe, more than three thousand persons had derived permanent benefit from its use. Experience, however, has taught us the true value of this remedy, and we now know it has no specific powers of curing or alleviating syphilis. It is applicable, as an alterative and sudorific, for the relief of secondary symptoms, especially venereal rheumatism and cutaneous eruptions, more particularly of scrofulous subjects. Mr. Pearson found it serviceable after the patient had been subjected to a mercurial course. Under its use, thickening of the ligaments or periosteum subsided, and foul indolent sores healed. During its administration the patient should adhere to a sudorific regimen.

6. *In scrofula*, especially that form called cutaneous, guaiacum is used with occasional advantage.

7. *In chronic pulmonary catarrh*, especially of gouty subjects, it has also been used.

Administration.—The *powder* of guaiacum resin may be given in doses of from grs. x. to ʒss. It may be administered in the form of pill, bolus, or mixture (see *Mistura Guaiaci*). The resin is a constituent of the *pilulæ hydrargyri chloridi compositæ*, Ph. L., commonly termed

Plummer's Pills (see p. 472), and of the *pulvis aloës compositus* (see p. 650). The resin is also given in the form of *alcoholic* and *ammoniated tincture*. The wood is exhibited in *decoction* only. It is a constituent of the *infusum sarsaparillæ compositum*, D. (see p. 669), and of *decoctum sarzæ compositum*, L. (p. 670).

1. *Mistura Guaiaci*, L. E. (Guaiacum, ℥iij.; Sugar, ℥ss.; Mucilage of Gum Arabic, f℥ss.; Cinnamon Water, f℥xix. Rub the Guaiacum with the Sugar, then with the Mucilage, and to these, while rubbing, add gradually the Cinnamon Water).—Dose, f℥ss. to f℥ij. twice or thrice a-day.

2. *Tinctura Guaiaci*, L. E. D. (Guaiacum, in coarse powder, ℥vij. [℥iij. *E.*, ℥iv. *D.*]; Rectified Spirit, Oij. [Oj. and f℥xvj. *E.*, Oij. wine measure, *D.*] Digest for fourteen [seven, *E. D.*] days, and then filter). —Stimulant, sudorific, and laxative. Dose, f℥j. to f℥iv. As it is decomposed by water, it should be administered in mucilage, sweetened water or milk, to hold the precipitated resin in suspension.

3. *Tinctura Guaiaci composita*, L. *Tinctura Guaiaci Ammoniata*, E. D. *Volatile Tincture of Guaiacum.* (Guaiacum, in coarse powder, ℥vij. [℥iij. *E.*, ℥iv. *D.*]; Aromatic Spirit of Ammonia, Oij. [lb.iss. *D.*] Spirit of Ammonia, f℥xviij. *E.*] Digest for fourteen [seven, *E. D.*] days [in a well-closed vessel, *E.*], and then filter).—A powerfully stimulating sudorific and emmenagogue. Dose, f℥ss. to f℥ij. May be taken as the preceding.

4. *Decoctum Guaiaci*, *E. D.* (Guaiacum turnings, ℥iij.; [Raisins, ℥ij. *E.*]; Sassafras, sliced, ℥j. [℥x. *D.*]; Liquorice Root, bruised, ℥j. [℥iss. *D.*]; Water, Oviij. [Ox. wine measure, *D.*] Boil the Guaiacum [and Raisins, *E.*] with the Water, gently down to Ov., adding the Liquorice and Sassafras towards the end. Strain the decoction).—This is the old *Decoction of the Woods.* The resin of guaiacum being insoluble in water, the extractive alone dissolves in this menstruum. The sassafras can confer but little activity to the preparation. Taken in doses of f℥iv. four or five times daily, and continued with a sudorific regimen, it acts on the skin, and has been thought to be useful as an alterative in old venereal, rheumatic, and cutaneous diseases.

Order 64. Oxalida'ceæ, *Lindley*.—The Woodsorrel Tribe.

Oxalideæ, *Decandolle.*

Essential Character.—*Sepals* five, sometimes slightly cohering at the base, persistent, equal. *Petals* five, hypogynous, equal, unguiculate, with a spirally-twisted æstivation. *Stamens* ten, usually more or less monadelphous, those opposite the petals forming an inner series, and longer than the other; *anthers* two-celled innate. *Ovary* with five angles and five cells; *styles* five, filiform; *stigmas* capitate or somewhat bifid. *Fruit* capsular, membranous, with five cells, and from five to ten valves. *Seeds* few, fixed to the axis, enclosed within a fleshy integument, which curls back at the maturity of the fruit, and expels the seeds with elasticity. *Albumen* between cartilaginous and fleshy. *Embryo* the length of the albumen, with a long radicle pointing to the hilum, and foliaceous cotyledons.—*Herbaceous plants, under-shrubs* or *trees*. *Leaves* alternate, compound, sometimes simple by abortion, very seldom opposite or somewhat whorled (Lindley).

Properties—Acidulous and refrigerant.

Oxa'lis Acetosel'la, Linn. L.—*Common Woodsorrel.*

Sex. Syst. Decandria, Pentagynia.

History.—Mr. Bicheno (*Phil. Mag.* vol. vii. p. 288, N. S.) declares this to be the genuine shamrock.

Botany. *Gen. Char.*—*Sepals* five, free or united at the base. *Petals* five. *Stamens* ten; *filaments* slightly monadelphous at the base, the five external alternate ones shorter. *Styles* five, pencilled at the apex or capitate. *Capsule* pentagonal, oblong, or cylindrical (*D. C.*)—Perennial *herbs*. *Leaves* never abruptly pinnate.

Sp. Char.—*Leaves* all radical, ternate; *leaflets* inversely heart-shaped, hairy. *Scape* single-flowered. *Root* [rhizome] scaly (Hooker).

An elegant little plant. *Leaflets* delicate bright green, often purplish at the back, drooping at night. *Footstalks* slender, purplish. *Bracts* two, scaly. *Flowers* drooping, white, with purplish veins.

Hab.—Indigenous; woody and shady places. Flowers in May.

Description.—Woodsorrel (*herba acetosellæ*) is odourless. Its taste is agreeably acidulous.

Composition.—I am unacquainted with any analysis of this plant. Its expressed juice yields by evaporation *binoxalate of potash*. Payen (*Journ. de Chim. Méd.* t. i. p. 260 N. S.) analyzed *Oxalis crenata*. From its stems he obtained *water*, *lignin*, *oxalate of potash*, *albumen*, *soluble nitrogenous matter*, *chlorophylle*, *oxalate of ammonia*, *free oxalic acid*, *oxides*, *salts*, *gum*, *aromatic substance*, and *sugar*. The quantity of oxalate of potash was from 1·06 to 1·23 per cent.

Binoxalate of Potash; Salt of Woodsorrel.—In Switzerland and some parts of Germany this salt is obtained on the large scale from woodsorrel, by evaporating the expressed juice, redissolving the residue, and crystallizing. 500 parts of the plant yield four parts of the crystallized salt. In this country it is usually obtained, I suspect, by the addition of potash or its carbonate to oxalic acid. It crystallizes in white rhombic prisms. It consists of

	Atoms.	*Eq. Wt.*
Oxalic acid	2	72
Potash	1	48
Water	2	18
Crystallized binoxalate potash	1	138

It is employed, under the name of *essential salt of lemons*, to remove ink-stains and iron-moulds from linen. When heated with oil of vitriol, carbonic acid and carbonic oxide gases are evolved, while bisulphate of potash is formed. Hence it may be used by the experimental chemist, to furnish the latter of these gases; the carbonic acid being removed by lime or potash.

Physiological Effects and Uses. — Woodsorrel is refrigerant. Taken as a salad, it is considered a good anti-scorbutic. Infused in milk, to form whey, or in water, it furnishes a grateful drink in fevers. A solution of the binoxalate of potash has been employed as a substitute for lemonade.

Order 65.—Vita'ceæ, *Lindley*.—The Vine Tribe.

Ampelideæ, *Kunth*, *Decandolle*.

Essential Character.—*Calyx* small, nearly entire at the edge. *Petals* four or five, inserted on the outside of the disk surrounding the ovary; in æstivation turned inwards at the edge, in a valvate manner, and often inflected at the point. *Stamens* equal in number to the petals, and opposite them, inserted upon the disk, sometimes sterile by abortion; *filaments* distinct, or slightly cohering at the base; *anthers* ovate, versatile. *Ovary* superior, two celled; *style* one, very short; *stigma* simple; *ovules* erect, definite. *Berry* round, often by abortion one-celled, pulpy. *Seeds* four or five, or fewer by abortion, bony, erect; *albumen* hard; *embryo* erect, about one-half the length of the albumen; *radicle* taper; *cotyledons* lanceolate, plano-convex. —Scrambling climbing *shrubs*, with tumid separable joints. *Leaves* with stipules at the base, the lower opposite, the upper alternate, simple or compound. *Peduncles* racemose, sometimes by abortion changing to tendrils often opposite the leaves. *Flowers* small, green (Lindley).

PROPERTIES.—Acid leaves, and a fruit like that of the common grape, is the usual character of the order (Lindley).

Vi'tis vinif'era, Linn. L. E. D.—*Common Grape-vine.*

Sex. Syst. Pentandria, Monogynia.

(Baccæ exsiccatæ demptis acinis, *L.*—Dried fruit, *E.*—Fructus siccatus, *D.*)

HISTORY.—The grape-vine has been known and cultivated from the most remote periods of antiquity. The Sacred Historian tells us that Noah (*Gen.* ix. 20) planted a vineyard and made wine. This was more than 2000 years before Christ. Among the most ancient of the profane writers, Homer (*Od.* vii. 121, and xxiv. 342), Hippocrates, and Herodotus (*Euterpe*, lxxvii.), may be referred to as speaking of the vine.

FIG. 225.

Vitis vinifera.

BOTANY. *GEN. CHAR.* — *Calyx* somewhat five-toothed. *Petals* five, cohering at the point, separating at the base, and dropping off like a calyptra. *Stamens* five. *Style* none. *Berry* two-celled, four-seeded; the cells or seeds often abortive (D. C.)

SP. CHAR.—*Leaves* lobed, sinuated, toothed, smooth or downy (D. C.)

A hardy, exceeding variable *shrub*. *Leaves* more or less lobed, smooth, pubescent or downy, flat or crisp, pale or intensely green. [*Tendrils* opposite to each footstalk, solitary, spiral.] *Branches* prostate, climbing or erect, tender or hard. *Racemes* loose or compact, ovate or cylindrical. *Fruit* red, pale, or white, watery or fleshy, globose, ovate or oblong, sweet, musky or austere. *Seeds* variable in number, or sometimes the whole of them abortive (D. C.) No less than 1400 varieties are cultivated at the Luxembourg gardens.

DESCRIPTION.—Grapes (*Uvæ*), considered with respect to their shape and colour, may be thus arranged (Thompson, in Loudon's *Encycl. of Gard.*):—

1. *Round, dark-red, purple, or black grapes.*—The most remarkable variety of this division is the *black Corinthian grape*, which, when dried, constitutes the *currant* of the grocer.

2. *Oval, dark red, purple or black grapes.*—To this division belongs the favourite *black Hamburgh grape.*

3. *Round and white grapes.*

4. *Oval and white grapes.*—The *Portugal grape* comes under this division. It is imported, packed in saw-dust and contained in earthen jars, from Portugal and Spain. The berries are large, fleshy, sweet, and slightly acidulous. They keep a long time after they have ripened. In 1822, the *ad valorem* duty of 20 per cent. on these grapes produced 1720*l.* (M'Culloch, *Dict. of Commerce*). The *white Cornichon* grape is remarkable for its elongated elliptical berry.

5. *Red, rose-coloured, greyish, or striped berries.*

Various parts of the vine, some of which were formerly employed in medicine, are distinguished by peculiar names: thus the leaves are termed *pampini;* the cirrhi or tendrils, *capreoli;* the tender shoots, *palmites;* the juice or sap, *lachryma;* and the juice of unripe grapes, *omphacium*, or commonly *agresta* (Murray, *App. Med.* i. 444). The twigs or cuttings of the vine are used for flavouring vinegar (see p. 219).

Composition.—The juice of unripe and ripe grapes has been examined by several chemists. The following are the most important results (Gmelin, *Handb. d. Chem.* ii. 1255):—

Juice of the Unripe Grape.			*Juice of the Ripe Grape.*	
Proust.	*Geiger.*		*Proust.*	*Bérard.*
Extractive. Malic acid, a little. Citric acid, much. Bitartrate of potash. Sulphate of potash. Sulphate of lime.	1. Deposit from the juice.	Wax. Chlorophylle. Tannin. Glutinous matter.	Extractive. Sugar (granular and uncrystallizable). Gum. Glutinous matter. Malic acid, a little. Citric acid, a little (tartaric, *Braconnot*). Bitartrate of potash.	Odorous matter. Sugar. Gum. Glutinous matter. Malic acid. Malate of lime. Bitartrate of potash. Supertartrate of lime.
Unripe Grape juice.	2. Filtered juice.	Tannin. Extractive. Sugar (uncrystallizable). Gallic acid. Tartaric acid (free) about 1·12 per cent. Malic acid (free) about 2·19 per cent. Bitartrate of potash. Malate, phosphate, sulphate, and muriate of lime.	Ripe Grape juice.	Ripe Grape juice.
	Juice of White Grape of good quality.			

1. *Grape Sugar.* — This is one variety of the *granular* or *crumbling sugars* (*Krümelzuckers*) of the Germans. It agrees with common sugar in its most essential properties (see p. 584), but is less soluble in water and in alcohol than the latter, and does not sweeten so effectually. From its boiling alcoholic solution it is deposited, on cooling, in the form of an irregularly crystalline mass. It consists, according to Saussure, of *carbon* 36·71, *hydrogen* 6·78, and *oxygen* 56·51; or $C^6 H^7 O^7$.

2. *Bitartrate of Potash.*—The impure bitartrate of potash, called *crude tartar* or *argol*, which is deposited during the fermentation of grape wine, and the purified bitartrate, have been already described (see p. 305).

Dried Grapes or Raisins.—Grapes, when properly dried, are denominated *Raisins* (*Uvæ passæ*). Of these there are two principal kinds:—

1. Raisins commonly so called (*Uvæ passæ majores; Passulæ majores*). In Granada the finest kinds of raisins (viz. the *Muscatels* and the *Blooms*) are sun-dried; while the *Lexias* (so called from the liquor in which they are immersed) are dipped in a mixture of water, ashes, and oil, and afterwards sun-dried (Inglis, *Spain in* 1830, vol. ii. p. 193). By this treatment the juice exudes and candies on the fruit. Dillon (*Trav. through Spain*, p. 376) states that the sun-dried raisins have their stalk half cut through while the bunch remains on the vine. The raisins of Valentia are prepared by steeping them in boiling water to which a lye of vine stems has been added (Laborde, *A View of Spain*, vol. iv. p. 99). Some raisins are said to be dried by the heat of an oven. Raisins are imported in casks, barrels, boxes, and jars. The best come in jars and quarter boxes weighing twenty-five lbs. The varieties known in the market are distinguished partly from their place of growth, as *Valentias* and *Smyrnas;* partly

from the variety of grape from which they are prepared, as *Sultanas*, *Blooms*, and *Muscatels;* and partly from the mode of curing them, as *Raisins of the Sun.* Muscatels are the finest. Sultanas are stoneless.

2. Corinthian Raisins or Currants (*Uvæ passæ minores; Passulæ minores; Passulæ Corinthiacæ*). These are obtained from a remarkably small variety of grape called the *Black Corinth.* They were formerly produced at Corinth (whence they received their name), but are now grown in Zante, Cephalonia, Patras, &c. At Zante they are gathered in August, disposed in couches on the ground to dry, cleaned, and laid up in magazines (called *seraglios*), where they eventually adhere so firmly as to require digging out (Spon and Wheler, *Voyage d'Italie*, &c. t. i. p. 85-7). They require eight, ten, or fourteen days for drying (Holland, *Travels in the Ionian Isles*, p. 21; and Williams, *Travels in Italy*, &c. vol. ii. p. 182). For exportation they are trod into barrels.

Physiological Effects.—*Fresh grapes*, when ripe, are wholesome, nutritious, refrigerant, and, when taken freely, diuretic and laxative. The skin and the seeds are indigestible, and should be rejected. "I think we may assert," says Dr. Cullen (*Mat. Med.* i. 253), "that grapes which contain a large quantity of sugar, are, if taken without their husks, the safest and most nutritive of summer fruits." *Raisins* are somewhat more nutritive, and less refrigerant; for they abound more in sugar, and less in acid, than the fresh grape; but if eaten too freely they are apt to disorder the digestive organs, and cause flatulence. They possess demulcent and emollient qualities.

Uses.—Both grapes and raisins are employed at the table as a dessert. They are apt to disagree with dyspeptics and children. Raisins are also used in various articles of pastry. Considered medicinally, *fresh grapes* prove valuable in febrile and inflammatory complaints. They allay thirst, and diminish febrile heat. They have been found serviceable in dysentery (Zimmerman, *Treat. on Dysent.* p. 87, 2nd ed. Lond. 1774), and in phthisical complaints (Moore, *View of Society*, &c. *in Italy*, vol. ii. p. 254).

Raisins are employed in medicine principally as flavouring agents. They enter into several officinal preparations (as *Decoctum Hordei compositum*, p. 588; *Decoctum Guaiaci*, p. 1214; *Tinctura Cardamomi composita*, p. 696; *Tinctura Sennæ composita*, p. 1170; and *Tinctura Quassiæ composita*, p. 1198), the flavour of which they improve, though they contribute nothing to the efficacy of these compounds.

1. *Acidum Tartaricum*, L. E. D.—First procured in the separate state by Scheele in 1770. Is peculiar to the vegetable kingdom. In the *free* state it exists in tamarinds, grapes, the pine-apple, and pepper. It is found in combination with a base; as in the form of *bitartrate of potash*, in tamarinds, grapes, mulberries, &c., and as *tartrate of lime* in the fruit of *Rhus typhinum.* The following directions for preparing it are given in the *London Pharmacopœia* of 1836:—

Bitartrate of Potash, lb. iv.; Boiling distilled Water, *Cong.* iiss.; Prepared Chalk, ℥xxv. and ʒvj.; Dilute Sulphuric acid, Ovij. and f℥xvij.; Hydrochloric acid, f℥xxviss. or as much as may be sufficient. Boil the Bitartrate of Potash with two gallons of distilled water, and add gradually half the prepared Chalk; then, the effervescence having ceased, add the remainder of the Chalk, previously dissolved in the Hydrochloric acid with four pints of distilled water. Lastly, set aside, that the Tartrate of Lime may subside; pour off the liquor, and wash frequently the Tartrate of Lime, with distilled water, until it be void of taste; then pour on it the diluted Sulphuric acid, and boil for a quarter of an hour. Evaporate the strained liquor by a gentle heat, that crystals may be formed.

Dissolve the crystals, that they may be pure, again, and a third time, in water, and strain the liquor as often; boil down, and set it aside.

The *theory* of the process is as follows:—By the mutual action of bitartrate of potash and carbonate of lime (chalk), we obtain tartrate of potash in solution and tartrate of lime precipitated, while carbonic acid escapes.—The following diagram explains the changes:—

REAGENTS.			RESULTS.	
1 Chalk = ... 50	1 Carbon Acid	22	1 Carbon. Acid = ...	22
	1 Lime	28		
1 Bitartr. Potash = 180	1 Tartr. Potash ..	114	1 Tartr. Potash = ...	114
	1 Tart. Acid	66	1 Tartr. Lime = ...	94

If to the solution of tartrate of potash we add chloride of calcium (obtained by dissolving chalk in hydrochloric acid), double decomposition ensues; tartrate of lime is precipitated, and chloride of potassium remains in solution.

REAGENTS.					RESULTS.	
1 Chlor. Calcium = 56	1 Chlor.		36		1 Chlor. Potass^m^. =	76
	1 Calcium		20			
1 Tartr. Potash = .. 114	1 Potash 48	1 Potass^m^.	40			
		1 Oxygen	8	1 Lime 28	1 Tartr. Lime = ..	94
	1 Tartaric Acid		66			

REAGENTS.			RESULTS.	
1 Tartr. Lime = 94	1 Tartaric Acid =	66	1 Tartaric Acid	66
	1 Lime = ...	28		
1 Sulphuric Acid = ...		40	1 Sulphate Lime =	68

The tartrate of lime obtained by the above two operations is then decomposed by sulphuric acid, which forms the almost insoluble sulphate of lime, and sets free the tartaric acid.

The processes of the *Edinburgh and Dublin Pharmacopœias* are essentially the same as that of the London one.

The *properties* of tartaric acid are as follows:—It crystallizes in elongated, colourless, inodorous, very sour, imperfectly transparent crystals, whose primary form is the oblique rhombic prism. They are permanent in the air. When heated they fuse, and undergo chemical changes varying with the degree and continuance of the heat. Fremy (*Ann. de Chim. et Phys.* Août 1838) states that they gradually lose their water and become successively *tartralic*, *tartrelic*, and *anhydrous tartaric acids*. By distillation tartaric acid yields *pyrotartaric* and *pyruvic acids*. Strongly heated in the air it evolves the odour of caramel, and furnishes a carbonaceous mass which eventually disappears by combustion. Cold water dissolves crystallized tartaric acid: boiling water takes up twice its own weight of the acid. The aqueous solutions become mouldy by keeping. Alcohol sparingly dissolves the acid. Heated with either nitric acid or potash it yields oxalic acid. By the action of sulphuric acid on it acetic acid is formed.

The following are the *characteristics* of this acid:—Its solution is very sour; with lime water it yields a white precipitate (*tartrate of lime*) soluble by either excess of acid or the addition of a little sal ammoniac. With acetate of lead it also forms a white precipitate (*tartrate of lead*) soluble in excess of acid. Dropped into a solution of sulphate of lime it furnishes no precipitate. Heated with a solution of chloride of platinum tartrate of potash occasions a black precipitate (*metallic platinum*). If excess of the acid be added to a concentrated solution of a potash salt, small granular crystals (*bitartrate of potash*) are deposited. With nitrate of silver tartrate of potash furnishes a white precipitate (*tartrate of silver*), which, when heated, does not deflagrate, but becomes brown, froths up, evolves white fumes, and leaves pure silver.

Tartaric acid is thus composed:—

	Atoms.	Eq. wt.	Per ct.
Carbon	4	24	36·36
Hydrogen	2	2	3·03
Oxygen	5	40	60·61
Dry Tartaric acid	1	66	100·00

	Atoms.	Eq. wt.	Per cent.
Dry Tartaric acid	1	66	88
Water	1	9	12
Cryst^{d} Tart^{c} acid	1	75	100

The only *adulteration* practised on this acid, that I have heard of, is the mixture of its powder with bitartrate of potash. This fraud may be detected by the difficult solubility in water of the bitartrate, and its yielding, on incineration, carbonate of potash (known by the tests described at p. 301). The tests for the purity of the acid, given by the London and Edinburgh Colleges, are as follows:—

"Totally soluble in water. The solution throws down bitartrate of potash from any neutral salt of potash. Whatever is precipitated from this solution by acetate of lead, is dissolved in diluted nitric acid."—*Ph. L.*

A precipitate insoluble in nitric acid would indicate the presence of sulphuric acid or a sulphate.

"When incinerated with the aid of the red oxide of mercury, it leaves no residuum, or a mere trace only."—*Ph. Ed.*

This test is devised to detect any fixed substance, and might be used to recognise the potash if bitartrate of this alkali had been present.

The *physiological effects* of tartaric acid, when taken *in small doses* and properly diluted, are those of a refrigerant (see p. 84). It reduces febrile heat, diminishes excessive vascular action, allays thirst, checks excessive perspiration, and perhaps also a too copious secretion of bile. It appears to promote the action of the absorbents, to increase the secretion of urine, and to act gently on the bowels. It possesses the tonic properties of the mineral acids (see p. 80) in a very slight degree only, if at all. Its continued use very readily disturbs the digestive process. Some doubt exists as to the effects of *large doses* of the acid. According to Dr. Christison (*Treat. on Poisons*, p. 208, 3rd ed.) it may be taken in very considerable quantities without injury. Six drachms have been taken in twenty-four hours without inconvenience. Pommer, however, asserts that when it is injected into the veins, it is scarcely less poisonous than oxalic acid.

Tartaric acid may be used as a cheap substitute for citric acid or lemon juice, in the formation of acidulous refrigerant drinks, for febrile and inflammatory disorders. It is, however, rarely employed for this purpose. Its common medicinal use is in the preparation of effervescing compounds, with the alkaline carbonates, especially with bicarbonate of soda. The relative proportions of acid and alkali have been already given (see pp. 175, 302, 303, 325, and 329). It is extensively employed by calico-printers.

2. *Vinum.*—The necessarily confined limits of this work, as well as the great extent to which the preceding subjects have run, compel me to devote a much smaller space to the consideration of wine than its interest and importance otherwise demand.

The *history* of wines is a topic of no slight interest, but one which must be very briefly noticed here. Noah (*Gen.* ix. 21) is the first on record who planted a vineyard and made wine. The ancient poets ascribed the invention of this liquor to the gods; and Homer (*Od.* ii. 341, and ix. 205) calls it ποτὸν θεῖον, *a divine beverage*, Hippocrates speaks of wine both as a dietetical and as a medicinal agent. When drank with equal quantity of water, he says (*Aphor.* sect. viii. 56), it dispels anxiety, yawning, and horrors. But of all the ancient writers, Pliny (*Hist. Nat.* lib. xiv. ed. Valp.) gives the most extensive and complete account of wine. He describes the vine, its different varieties and their places of growth, and its culture; the preparation of wine, and the properties of its different kinds; the sophistications practised on it; wine cellars and the ill consequences of drunkenness. He states there are 195 principal kinds of wine, though, if the varieties are enumerated, almost double that number (cap. xxix.) But in another place (cap. xiii.), he says that the good wines may be reduced to eighty.—(For further information on the history of wines consult Barry, *Obs. on the Wines of the Ancients*, 1775; and Henderson, *Hist. of Anc. and Mod. Wines*, 1824).

The *manufacture* of wine deserves a passing notice. Grape juice does not ferment in the grape itself. This is owing, not as Fabroni (*De l'Art de faire le Vin*, Paris 1801) supposed, to the gluten being contained in distinct cells to those in which the saccharine juice is lodged, but to the exclusion of atmospheric oxygen, the contact of which, Gay Lussac (*Ann. de Chim.* lxxvi. 245) has shewn, is necessary to effect some change in the gluten, whereby it is enabled to set up the process of fermentation. The expressed juice of the grape, called *must* (*mustum*), whose composition has been already stated (see p. 1217), readily undergoes the vinous fermentation when subjected to the temperature of between 60° and 80° F. It becomes thick, muddy, and warm, and evolves carbonic acid gas. After a few days this process ceases, the thick part subsides, the liquid becomes clear, and is then found to have lost its sweet taste and to have become vinous. I have already explained the theory of the process (see p. 194; also, for some remarks respecting yeast, p. 589). The wine is now drawn off into casks, where it undergoes further changes. It is then racked off into other casks, where it is subjected to the operation of *sulphuring* (*i. e.* exposed to sulphurous acid, either by burning sulphur matches in the cask or by the addition of wine impregnated with this acid), to render the glutinous matter incapable of re-exciting fermentation. After this, the wine is usually clarified, or *fined* (i. e. deprived of those matters which render the wine turbid, and dispose it to undergo deteriorating changes). Isinglass or white of egg (*i. e.* gelatine or albumen) is commonly employed for this purpose. The first forms with the tannic acid—the second with the alcohol, reticulated coagula, which envelop and carry down the solid particles that endanger the safety of the wine.—(For further details consult Chaptal, *L'Art de faire le Vin*, 2e éd. Paris, 1819; also *Ann. de Chim.* t. xxxv. xxxvi. and xxxvii.; and Dr. Macculloch, *Remarks on the Art of Making Wine*, 1816).

The peculiar qualities of the different kinds of wine depend on several circumstances; such as the variety and place of growth of the vine from which the wine is prepared,—the time of year when the vintage is collected,—the preparation of the grapes previously to their being trodden and pressed,—and the various manipulations and processes adopted in their fermentation.

The wines of different countries are distinguished in commerce by various names. The following is a list of the wines most commonly met with, arranged according to the countries producing them:—

1. French Wines.—*Champagne* (of which we have the *still*, *creaming*, or *slightly sparkling*,—the *full frothing*,—the *white*,—and the *pink*); *Burgundy* (*red* and *white*); *Hermitage; Côtie Rôtie; Roussillon; Frontignan; Claret* (the most esteemed being the produce of *Lafitte*, *Latour*, *Château Margaux*, and *Haut-Brion*); *Vin de Grave; Sauterne;* and *Barsac.*
2. Spanish Wines.—*Sherry* (Xeres); *Malaga* or *Mountain;* and *Alicant.*
3. Portugal Wines.—*Port* (Oporto) and *Lisbon.*
4. German Wines.—*Rhine* and *Moselle Wines.* The term *Hock* (a corruption of *Hochheimer*) is usually applied to the first growths of the Rhine. The term *Rhenish* commonly indicates an inferior Rhine wine.
5. Hungarian Wines.—*Tokay.*
6. Italian and Sicilian Wines.—*Lachryma Christi; Mazzara; Marsala; Syracuse; Lissa.*
7. Grecian and Ionian Wines.—*Candian* and *Cyprus* wines.
8. Madeira and the Canary Islands.—*Madeira* and *Canary* (*Teneriffe*).
9. Wines of the Cape of Good Hope.—*Cape* (*Constantia* is the best kind).
10. Persian Wines.—*Shiraz.*
11. English Wines.—*Grape* and *Raisin.*

Wines are also designated, according to their colour, *red* or *white;* according to their taste and other properties, *sweet, acidulous, dry, strong* or *generous, light, rough, sparkling*, &c.

The *constituents* of wine are, according to Gmelin (*Handb. d. Chem.* ii. 1255), as follows:—*Alcohol, an odorous principle* (volatile oil?), *blue colouring of the husk* (in red wine), *tannin, bitter extractive, sugar* (especially in the sweet wines), *gum, yeast, acetic acid* (from the commencement of the acetous fermentation), *malic acid, tartaric acid, bitartrate of potash, bitartrate of lime, sulphates* and *chlorides, phosphate of lime, carbonic acid* (especially in the effervescing wines), and *water.* To these may be added *paratartaric* or *racemic acid.*

1. *Bouquet of Wine; Odoriferous Principle of Wine.*—Every wine has a peculiar odour, which depends, doubtless, on a small quantity of volatile oil. The oil obtained from corn and potatoe spirit has been already noticed (see p. 196). Liebig and Pelouze (*Ann. de Chim. et de Phys.* lxii. 438) have examined the oily liquid procured in the distillation of wine, as well by submitting wine lees to distillation, and found it to be *œnanthic ether* ($C^{18}\ H^{18}\ O^{3}$) mixed with *œnanthic acid* ($C^{14}\ H^{13}\ O^{2}$). From 22,000 lbs. (about 2200 imperial gallons) only two lbs. and one-fifth of oily liquid were procured.

2. *Alcohol.*—Mr. Brande (*Phil. Trans.* for 1811, p. 337, and for 1813, p. 82) has shewn that alcohol exists ready formed in wine. He also ascertained the quantity of this substance which exists in different wines. The latter point has also been examined by several other chemists; as Geiger (Gmelin, *Handb. d. Chem.* ii. 1256), Fontenelle (*Journ. de Chim. Med.* iii. 332), Prout and Ziz (Henderson, *op. cit.* p. 363). Wines which contain a comparatively small quantity of spirit are denominated *light wines;* while those which have a much larger quantity are denominated *strong* or *generous wines.*

Table of the proportion of Alcohol (sp. gr. 0·825 at 60° F.), *by measure, contained in* 100 *parts of Wine.**

		Brande.	*Others.*
1.	Lissa	A. 25·41	15·90 *P.*
2.	Raisin	A. 25·12	
3.	Marsala	A. 25·09	18·40 *P.*
4.	Port	A. 22·96	20·64 *P.*
5.	Madeira	A. 22·27	21·20 *P.*
6.	Currant	20·55	
7.	Sherry	A. 19·17	23·80 *P.*
8.	Teneriffe	19·79	
9.	Colares	19·75	
10.	Lachryma Christi	19·70	
11.	Constantia, white	19·75	14·50 *P.*
12.	Constantia, red	18·92	
13.	Lisbon	18·94	
14.	Malaga	18·94	
15.	Bucellas	18·49	
16.	Red Madeira	A. 20·35	
17.	Cape Muschat	18·25	
18.	Cape Madeira	A. 20·51	
19.	Grape Wine	18·11	
20.	Calcavella	A. 18·65	
21.	Vidonia	19·25	
22.	Alba Flora	17·26	
23.	Malaga	17·26	
24.	White Hermitage	17·43	
25.	Rousillon	A. 18·13	
26.	Claret	A. 15·10	
27.	Zante	17·05	
28.	Malmsey-Madeira	16·40	
29.	Lunel	15·52	18·01 *F.*
30.	Sheraaz	15·52	
31.	Syracuse	15·28	30·00 *P.*
32.	Sauterne	14·22	
33.	Burgundy	A. 14·57	12·16 *P.*
34.	Hock	A. 12·08	
35.	Nice	14·63	
36.	Barsac	13·86	
37.	Tent	13·30	
38.	Champagne	A. 12·61	12·20 *F.*
39.	Red Hermitage	12·32	
40.	Vin de Grave	13·94	
41.	Frontignac (Rivesalte)	12·79	
42.	Côte Rôtie	12·32	
43.	Gooseberry	11·84	
44.	Orange	A. 11·26	
45.	Tokay	9·88	
46.	Elder	8·79	

3. *Free Acids.*—All wines are more or less acidulous, as determined by litmus. They owe this property principally to malic acid, but in part also to citric and tartaric acids. The Rhenish and Moselle wines and claret are termed *acid wines.* The brisk, frothing, sparkling, or *effervescent wines* (as Champagne), which are bottled before fermentation is complete, owe their peculiar properties to the retention, and subsequent escape when the confining force is removed, of the developed carbonic acid gas. They are apt to become *ropy*; a change which is prevented by pure tannic acid or powdered nutgalls. The tannic acid of some wines, especially the red wines (as Port), is derived, in great part, from the husk of the grape, but partly, perhaps, from the seeds. It gives to these wines their astringency and power of becoming dark-coloured with the ferruginous salts.

4. *Sugar.*—This constituent varies considerably in quantity in different wines. Those in which it is abundant are denominated *sweet wines*, as Tokay, Tent, and Frontignac.

5. *Extractive.*—Exists in all wines, but diminishes (by deposition) with their age.

6. *Colouring matter.*—All wines contain more or less colouring matter. When grape juice, without the husks of the fruit, is fermented, the wine is pale, and is denominated *white wine*; but if the husk be present during fermentation, the wine is deep-coloured, and is usually called *red wine.* Except in the *tintilla* or *teinturier* grape the purple colouring matter resides in the husk, and is dissolved by the newly-formed alcohol, and is reddened by the free acid. In the exception just mentioned, the colouring matter is diffused through the pulp. According to Nees von Esenbeck, the purple colouring matter of the grape resides on the inner side of the husk (epicarp). By exposure to the sun, as well as by age, the colour of wines is diminished; the colouring matter being precipitated. It may be artificially removed by milk, lime water, or charcoal.

7. *Tartar* (*Bitartrate of Potash*).—The most important saline constituent of wine is tartar. It deposits, along with colouring and extractive matters, both in the cask and bottle, constituting *argol* (see p. 305) and the *crust.* The deposition increases with the formation of alcohol. Red wines (especially the youngest, roughest, and most coloured) contain more than white wines.

Various impositions are said to be practised by dealers on the consumers of wines. Inferior kinds are sometimes substituted for the finer ones. Unequal qualities of the same variety are often mixed. Brandy is added to some (as to Port) to give artificial strength; kino, to communicate a rough taste. Colouring matters, of various kinds, are also employed to deepen or change the tint: as the juice of the elderberry, or black cherry, for the red wines,—burnt sugar, to give the admired brown tint to Sherry. Artificial mixtures, even, are said to have been sold as

* A. means average, *F.* Fontenelle, *P.* Prout.

genuine wines. Lead, formerly used to sweeten wine (see Beckmann, *Hist. of Invent.* vol. i. p. 396), may be occasionally detected, in very minute quantity, in wine (by sulphuretted hydrogen, see p. 505). It is usually to be traced to shot in the bottle, and rarely to fraud (see a case in the *Phil. Mag.* liv. 229).

The *physiological effects* of wine next deserve our attention. Taken in moderate quantities, wine operates as a stimulant to the nervous and vascular systems, and the secreting organs. It quickens the action of the heart and arteries, diffuses an agreeable warmth over the body, promotes the different secretions, communicates a feeling of increased muscular force, excites the mental powers, and banishes unpleasant ideas. In a state of perfect health, its use can be in no way beneficial, but, on the contrary, its habitual employment is calculated to prove injurious, by exhausting the vital powers, and inducing disease. The actual amount of injury which it may inflict will of course vary with the quantity and quality of the wine taken, and according to the greater or less predisposition to disease which may exist in the system. Maladies of the digestive organs, and of the cerebro-spinal system, gout and dropsy, are those most likely to be induced or aggravated by it. Intoxication in its varied forms is the effect of excessive quantities of wine. It is remarkable, however, that though the effects of wine mainly depend on the alcohol contained in this liquor, yet they differ in several circumstances from those of the latter (described at p. 200 et seq.) In the first place, wine possesses a tonic influence not observed after the use of ardent spirit. Common experience proves to every one, that the stimulant influence communicated by wine is slower in its production and subsidence than that developed by spirit. In the second place, the intoxicating influence of wine is not equal to that of mixtures of ardent spirit and water of corresponding strengths, nor proportionate, in different wines, to the relative quantities of alcohol which they contain. This will be obvious from the following table:—

Average quantities of Ardent Spirit and of Wine, containing four fluidounces of Alcohol (sp. gr. 0·825 at 60° F.)

Brandy, about	8	fluidounces.
Port wine	18½	ditto.
Claret	26½	ditto.
Champagne	32	ditto.

Now it is obvious from this table that if the intoxicating power of vinous liquids was in proportion to the spirit contained in them, that a pint of Port wine would be almost equal to half a pint of brandy, and that Claret would exceed Champagne in its influence over the nervous system ; all of which we know not to be the case. It is therefore obvious, that the other constituents of the wine possess the power of modifying the influence of the alcohol. Furthermore, it is probable that they are enabled to do this by being in chemical combination with the spirit. For it is asserted by connoisseurs, that a brandied wine (*i. e.* wine to which brandy has been added) is more intoxicating than a non-brandied wine equally strong in alcohol. Hence dealers endeavour to obviate this by the operation of *fretting in*, and which, in a scientific point of view, may be regarded as effecting the chemical combination of the foreign spirit with the constituents of the wine, by a second or renewed fermentation. A third distinction between the operation of wine and ardent spirit is the greater tendency of the latter to induce disease of the liver. "It is well known," observes Dr. Macculloch (*op. cit.*), "that diseases of the liver are the most common, and the most formidable of those produced by the use of ardent spirits; it is equally certain that no such disorders follow the intemperate use of pure wine, however long indulged in. To the concealed and unwitting consumption of spirit, therefore, as contained in the wines commonly drank in this country, is to be attributed the excessive prevalence of those hepatic affections which are comparatively little known to our continental neighbours."

The *uses* of wines are threefold—dietetical, medicinal, and pharmaceutical. To persons in health, the *dietetical* employment of wine is either useless or pernicious. The least injurious are the light wines, especially Claret.

As a *medicinal* agent, wine is employed principally as a cordial, stimulant, and tonic; but some of the wines possess astringent and acid properties, for which they are occasionally resorted to. In the latter stages of fever, when languor and torpor have succeeded to a previous state of violent action, and in the low forms of this disease, wine is at times undoubtedly useful. It supports the vital powers, and often relieves delirium and subsultus tendinum, and promotes sleep. But it is much less frequently and copiously employed than formerly. As a stimulating tonic and invigorating agent, it is given in the convalescence from fever, and from various chronic non-febrile diseases. In extensive ulceration, copious suppuration, gangrene of the extremities, and after extensive injuries or severe operations, or profuse hemorrhages, when the powers of life appear to be failing, wine is administered often with the best effects. It has been liberally employed in tetanus, and at times with apparent alleviation of the disease. If in any of the preceding cases it causes dryness of the tongue, thirst, quick pulse, restlessness, or delirium, it should of course be immediately laid aside. And it is obvious that in acute inflammation, especially of the brain or thoracic organs, in tendency to sanguineous apoplexy, and in the first or acute stage of fever, the employment of wine is objectionable, and calculated to prove highly injurious. *Port-wine (Vinum Lusitanicum* seu *Portugallicum)* is applicable to most of the purposes above mentioned for which a stimulant and tonic is required, and is the wine ordinarily employed in the public hospitals of this metropolis. On account of its astringency, it is particularly useful in those cases which are attended with a relaxed condition of the bowels; but it is apt to disagree with weak stomachs. A mixture of two-thirds Port-wine and one-third water is used as an injection for the radical cure of hydrocele. *Burgundy (Vinum Burgundicum)* is a stimulant, and somewhat astringent wine; but is rarely used in this country for medicinal purposes. *Sherry (Vinum Xericum*, Ph. L.; *Vinum album*, Ph. Ed.; *Vinum album Hispanum*, Ph. D.) is peculiarly valuable, on account of the small quantity of free acid which it contains; and it is, therefore, the wine best adapted for patients troubled with gout, or having acidity of stomach, or a deposition of lithic acid in the urine. *Madeira (Vinum Maderaicum)* is a more stimulating wine than Sherry, and is, therefore, better adapted for old persons and debilitated broken-down constitutions, where its slight acidity is not objectionable. It is an excellent wine for invalids. *Champagne (Vinum Campanicum)* is a diuretic and a speedy intoxicator. It excites lively and agreeable feelings, and, in consequence, is adapted for hypochondriacal cases. On account of the evolution of carbonic acid, it may be occasionally employed to allay vomiting. It is objectionable in gouty subjects. The *Rhine wine (Vinum Rhenanum)*, of which *Hock (Vinum Hochheimense)* is the most familiar example, and the *Moselle wine (Vinum Mosellanum)*, are refrigerant and light wines. They prove diuretic, and slightly aperient. Their acidity adapts them for use where phosphatic sediments are observed in the urine. They are used also in low fever, with at least less likelihood of doing harm than the stronger wines. *Claret (Vinum rubellum)* has been already mentioned as one of the least injurious of wines. It is adapted for the same cases as the Rhine and Moselle wines. Both are, of course, objectionable in gouty cases and lithic acid deposits, on account of their acidity.

As a *pharmaceutical agent*, wine is employed for the preparation of the *medicated wines (vina medicata)*. *Sherry* is the kind employed by the British colleges; but for economy druggists often use Cape wine. Its efficacy resides essentially in the alcohol which it contains. In some cases, however, its acidity may increase its solvent power. But as the quantity of alcohol which it contains is variable, and as it is more liable to undergo decomposition than a tincture containing the same proportion of spirit, the medicated wines are objectionable preparations.

3. *Spiritus Vini Gallici*, L.—*Brandy.* An ardent spirit obtained in France by the distillation of wine. A *British Brandy* is manufactured in this country. To the account of brandy and other ardent spirits already given (see pp. 196—206) I have nothing now to add. The strength of brandy, as ascertained by Sykes's hydrometer, should be 10 per cent. under proof.

4. *Mistura Spiritus Vini Gallici*, L. *Egg-Flip.*—(Brandy, Cinnamon Water, of each, f℥iv.; the Yolks of two Eggs; Purified Sugar, ℥ss.; Oil of Cinnamon, ♏ij. Mix). Stimulant and restorative. Exceedingly valuable in the last stage of fever, and in extreme exhaustion from uterine and other hemorrhages. Dose, f℥ss. to f℥iss.

Order 66. Guttif'eræ, *Jussieu.*—The Mangosteen Tribe.

Clusiaceæ, *Lindley.*

Essential Character.—*Sepals* two to six, usually persistent, round, frequently unequal and coloured; æstivation imbricated. *Petals* hypogynous, four to ten. *Stamens* hypogynous, indefinite, or rarely definite, distinct or variously united at the base; *filaments* unequal; *anthers* adnate, introrse or extrorse, sometimes very small, sometimes unilocular, and sometimes opening by a pore. *Torus* fleshy, occasionally five-lobed. *Ovary* solitary, one- or many-celled; *ovules* solitary, or several in each cell, erect or ascending, or numerous and attached to several placentæ; *style* usually none or very short, seldom conspicuous; *stigmas* peltate or radiate. *Fruit* capsular or fleshy, or drupaceous, one- or many-celled, valvular and septicidal, or indehiscent. *Seeds* definite, in a pulp, apterous, often arillate; *testa* thin and membranous; *albumen* none; *embryo* straight; *radicle* small next the hilum; *cotyledons* large, thick and fleshy, often cohering.—*Trees* or *shrubs*, sometimes parasitical. *Juice* resinous. *Leaves* exstipulate, always opposite, coriaceous,

Fig. 226.

Garcinia Mangostana.

with a strong midrib, and many oblique lateral parallel leaves. *Flowers* articulated with their peduncle.—(*Wight* and *Arnott.*)

PROPERTIES.—The species all abound in a viscid, yellow, acrid, and purgative gum-resinous juice resembling Gamboge (*Lindley*). Several species of *Garcinia* yield edible fruits. The fruit *G. Mangostana* (fig. 226) is the most delicious of East Indian fruits, and is "the only fruit which sick people are allowed to eat without scruple."

Hebraden'dron cambogioi'des, Graham, E.—*The Gamboge Hebradendron.*

Cambogia Gutta, *Linn.*—Stalagmitis cambogioides, *Moon.*

*Sex. Syst.** Monœcia, Monadelphia.

(Gummy-resinous exudation, *E.*)

HISTORY.—The first notice of gamboge is by Clusius (*Exot.* lib. iv. cap. viii. p. 82) in 1605. He received this gum-resin in 1603, from Peter Garet, of Amsterdam. It had been brought from China by Admiral van Neck and his companions, and its oriental name was said to be *Ghittaiemou.*

FIG. 227.

Hebradendron cambogioides.

A. Male flowering branch.
1. Back view of a flower.
2. Side view of the calyx and column of stamens.
B. Fruit-bearing branch.
3. Section of fruit with its four sides.

BOTANY. *GEN. CHAR.*—*Flowers* unisexual. *Males: sepals* four, membranous, permanent. *Petals* four. *Stamens* monadelphous, with a quadrangular column; *anthers* terminal, with an umbilicated circumscissile operculum. *Females* unknown. *Berry* many- (four) celled; cells one-seeded; surrounded by a few abortive distinct stamens, and crowned by a sessile-lobed muricated stigma. *Cotyledons* thick, consolidated; *radicle* central filiform.—*Trees* with entire leaves (Graham, *Comp. to Bot. Mag.* ii. 199).

SP. CHAR.—*Male flowers* axillary, fascicled. *Sepals* when young nearly equal. *Leaves* obovate-elliptical, abruptly subacuminate (Graham).—A *tree* of moderate size. *Leaves* opposite, stalked. *Male flowers: sepals* four, imbricated, concave, yellow on the inside, yellowish-white on the outside. *Petals* spathulato-elliptical, crenulate, yellowish-white, red on the inside. *Berry* about the size of a cherry, round with a firm reddish-brown external coat, and sweet pulp. *Seeds* large in proportion to the berry, reniform elliptical (condensed from Graham).

HAB.—Ceylon.

Siam Gamboge, the Gamboge of the shops, is a "gum-resin from an unascertained plant inhabiting Siam, probably a species of *Hebradendron,*" E. The *Stalagmitis Cambogioides*, Murray (Comm. Gotting. ix. 169). L.; *S. Cambogia*, Persoon. D. does not really exist. The specimen, which has been described as such, is in the Banksian Herbarium, and was found by Mr. Brown (Graham, *op. supra cit.* p. 197) to consist of two plants (*Xanthochymus ovalifolius* of Roxburgh, and *Hebradendron cambogioides* of Graham), the union of which had been concealed by sealing-wax. As it appears, according to Dr. Christison (*Comp. to the Bot. Mag.* vol. ii. p. 236), that the gamboge of Siam is "as nearly as possible identical in composition and properties" with that of

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* As the female flowers have not yet been examined, the true place of this plant in the sexual system must at present be doubtful. Linnæus put his genus *Cambogia* in *Polyandria, Monogynia.*

Ceylon, it is probable that both are obtained from the same, or some nearly allied species. Indeed it has been suggested that the plant may have been carried from Siam to Ceylon: for the Bhoodist religion is supposed to have passed from the former to the latter country, and with it the practice of painting the temples and holy dresses with gamboge.

Preparation.—The only account which we possess of the method of obtaining Siam gamboge, is that given to König by a Catholic priest residing at Cochin-China (Murray, *App. Med.* iv. 656). According to this statement, when the leaves or branchlets are broken, a yellow milky juice issues *guttatim* (hence the origin of the term *Gummi Guttæ* applied to gamboge), and is received either on the leaves of the tree, or in cocoa-nut shells, and from thence is transferred into large flat earthen vessels, where it is allowed to harden during the summer season, and is afterwards enveloped with leaves. The cylindrical or pipe variety receives its form by being run into the joints of the bamboo, while it is in the liquid state (White, *Voyage to the China Seas*, Boston, 1823, p. 250, quoted by Dr. A. T. Thomson in the *Lond. Dispens.*) A few years since there was an importation of gamboge in the bamboo cylinders (*gamboge in the bamboo*). Each cylinder or stem was about twenty-one inches long and one inch and a half in diameter, closed at the lower end by the transverse position of the nodus, and at the upper by a piece of oil skin.

In Ceylon, gamboge is obtained by wounding the bark of the tree in various places with a sharp stone, when the flowers begin to appear. The cream-like juice which exudes, hardens in the sun (Murray, *op. cit.* pp. 108 and 657). According to Mrs. Walker, the Cingalese method of collecting it is "by cutting pieces of the bark completely off, about the size of the palm of the hand, early in the morning. The gamboge oozes out from the pore of the bark in a semi-liquid state, but soon thickens, and is scraped off by the collectors next morning, without injury to the tree, the wounds in the bark readily healing and becoming fit to undergo the operation again" (Graham, *op. supra cit.* p. 196).

Description.—Two kinds of gamboge (*cambogia; gummi-gutta*) are described by pharmacological writers—viz. the Siam and the Ceylon. Of these the first only is known in commerce.

1. *Siam Gamboge* (*Cambogia Siamensis*, Ph. Ed.) — This is the *gamboge* of the shops. It is brought to this country sometimes direct from Siam, at other times indirectly by way of Singapore, Penang, or Canton. It comes over in boxes, cases, or chests. In 1839, duty (4s. per cwt.) was paid on 15 cwts; in 1838, on 40 cwts. It presents itself in commerce in three forms:—1st, *in rolls* or *solid cylinders;* 2dly, *in pipes* or *hollow cylinders;* 3dly, *in cakes* or *amorphous masses.* Both the solid and hollow cylinders are known in commerce as *pipe gamboge.* What is called *coarse gamboge* consists of the commonest pieces of the above.

a. Pipe gamboge consists of cylindrical pieces, varying in size from one to three inches in diameter. Some of them appear to have been formed by rolling, but many of them are striated, from the impression of the bamboo stems into the hollow of which the gamboge juice has been run, and not unfrequently portions of the stems are still adherent; and on one occasion, as above mentioned, the gamboge was imported in the stems (*gamboge in the bamboo*). The gamboge cylinders are sometimes distinct, and covered externally with a dirty greenish-yellow dust; at others agglutinated, or even folded, so as to form masses of varying sizes and forms. Pipe gamboge occurs of all qualities,—the finest and the worst specimens of gamboge which I ever saw having this form. *Fine gamboge* is brittle and odourless; it has very little taste at first, but, after some time, it causes a sensation of acridity in the throat. Its fracture is conchoidal: its fractured surface is opaque, reddish-yellow, with a glimmering lustre. It is completely dissolved by the successive action of ether and water. Mixed with a sufficient quantity of water, it forms a yellow emulsion, the films of which are excellent microscopic objects for observing the *active molecules* described by Mr. R. Brown (*Phil. Mag.* for Sept. 1828 and 1829). The powder of fine gamboge is bright yellow. The *Edinburgh College* gives the following characters of pure gamboge:—

"Fracture somewhat conchoidal, smooth, and glistening: a decoction of its powder, cooled, is not rendered green by tincture of iodine, but merely somewhat tawny."

The iodine is employed to prove the absence of starch. *Inferior qualities* of gamboge are harder, more earthy in fracture; the fractured surface is brownish- or greyish-yellow, frequently with black spots, from the presence of foreign bodies which are intermixed. It is not completely dissolved by the successive action of ether and water. Iodine readily detects, in the cooled decoction, starch, by the green colour which it gives rise to.

β. *Lump* or *Cake Gamboge* occurs in masses of several pounds weight. Its quality is inferior to the finest pipe kind. Internally we observe fragments of wood, twigs, and air-cells. In most of its characters it agrees with the inferior qualities of pipe gamboge, and like this contains starch.

2. Ceylon or Cingalese Gamboge (*Cambogia Zeylanica*, Ph. Ed.) —I am unacquainted with this kind of gamboge, which is unknown in English commerce. Dr. Christison says, that, as he has seen it, it "is usually in small irregular fragments, but as originally collected, is in flattish round masses, as if moulded in shallow bowls, weighing about a pound or upwards; and it appears to be composed of aggregated irregular tears, with interspaces and cavities, which are lined with a dark powdery matter, or with a powder of an earthy appearance. Altogether it seems a very coarse article." It forms, "with great ease, an emulsion nowise inferior in smoothness, and very little, if at all, in liveliness of tint, to that of the very best Pipe Gamboge of Siam."

Composition.—Gamboge was analysed, in 1808, by Braconnot (*Ann. de Chim.* lxviii. 33); in 1813, by John (Gmelin, *Handb. d. Chem.* ii. 526); and in 1836, by Dr. Christison (*Comp. to the Bot. Mag.* ii. 233).

	Siam Gamboge.						*Ceylon Gamboge.*		
	Cylindrical or Pipe.		Cake or Lump.		Coarse.				
	First.	Second.	First.	Second.	First.	Second.	First.	Second.	Third.
Resin	74·2	71·6	64·3	65.0	61·4	35·0	68·8	71·5	72·9
Soluble gum .	21·8	24·0	20·7	19·7	17·2	14·2	20·7	18·8	19·4
Woody Fibre ..	trace.	trace.	4·4	6·2	7·8	19·0	6·8	5·7	4·3
Fecula	—	—	6·2	5·0	7·8	22·0	—	—	—
Moisture	4·8	4·8	4·0	4·2	7·2	10·6	4·6	not ascertained.	not ascertained.
Gamboge	100·8	100·4	99·6	100·1	101·4	100·8	100·9	96·0	96·6

1. *Gambogic Acid; Gambodic Acid,* Johnson; *Resin,* Christison.—Obtained by evaporating to dryness the etherial tincture of the pure gum-resin. It is brittle, in thin layers of a deep-orange colour, in thicker masses of a cherry-red tint. It is insoluble in water, but soluble in alcohol, and still more so in ether. It communicates an appreciable yellowness to 10,000 times its weight of spirit. It is soluble in the caustic alkalies, forming dark-red solutions (*alkaline gambogiates*), which yield, with acids, a yellow precipitate (*gambogic acid*); with acetate of lead, a yellow (*gambogiate of lead*); with the salts of iron, a dark-brown (*gambogiate of iron*), and with sulphate of copper, a brown one (*gambogiate of copper*). The composition of gambogic acid, according to Johnson (*Proceed. of the Royal Soc.*, June 20, 1839), is C^{40} H^{23} O^{8}.—In doses of five grains, gambogic acid occasioned profuse watery discharges without pain, or other uneasiness. If the activity of gamboge depended solely on the resin, five, or five and a half, grains of the resin should be equal to seven of gamboge; but, according to Dr. Christison, this is not the case. Hence, either it is not the sole active ingredient, or it becomes somewhat altered in the process for procuring it; the latter supposition is the more probable.

2. *Gum* (*Arabine*?)—The gum of gamboge is soluble in water, like gum arabic.

3. *Starch* or *fecula.*—This substance, which is found in common gamboge, is doubtless an adulterating substance.

Chemical Characteristics.—Gamboge emulsion becomes transparent and deep-red on the addition of potash, forming *gambogiate of potash.* Digested in alcohol or ether, gamboge yields orange-red tinctures (*solutions of gambogic acid*). The etherial tincture dropped on water, yields, on the evaporation of the ether, a thin, bright-yellow, opaque film or scum (*gambogic acid*), soluble in caustic potash. The alcoholic tincture dropped into water, yields a bright, opaque, yellow emulsion, which becomes clear, deep-red, and transparent, on the addition of caustic potash. The gambogiate of potash (obtained by any of the above processes) gives, if the alkali be not in excess, with acids, a yellow precipitate (*gambogic acid*); with several metallic salts, as acetate of lead, nitrate of silver, &c., yellow precipitates (*metallic gambogiates*); with sulphate of copper, brown (*gambogiate of copper*); and with the salts of iron, dark-brown (*gambogiate of iron*).

The detection of gamboge in pills has become, on some occasions, an important object of medico-legal research (*Trial of Joseph Webb, at York Summer Assizes*, 1834, *taken by Mr. Frazer.* Lond. 1834). Spurious *extractum colocynthidis compositum* and the *pill cochiæ* of the shops, sometimes contain gamboge (see p. 1079). The mode of detection, in all these cases, is simple:—Digest one portion of the suspected substance in alcohol, and another in ether. Then subject the alcoholic and etherial tinctures to the tests above-mentioned.

In external appearance the resin of *Xanthorrœa hastile* (see p. 658) is the only substance that could, by a remote possibility, be confounded with gamboge. But the above chemical characters readily distinguish gamboge. They would also prevent the yellow colouring matter of saffron (p. 675), of turmeric (p. 686), and of rhubarb (p. 817), being confounded with that of gamboge.

Physiological Effects. (*a.*) *On animals generally.*—The animals on which the effects of gamboge have been tried, are dogs, horses, oxen, sheep, and rabbits. From his experiments on dogs, Orfila (*Toxicol. Gén.*) inferred that it is a powerful local irritant; and that when applied to any of the animal tissues, its fatal operation depends, not on its absorption, but on its powerful local action, and on the sympathetic irritation of the nervous system. It appears to be an uncertain and dangerous medicine for herbivorous animals, and is, therefore, rarely or never employed by veterinarians. Daubenton states, that two drachms killed a sheep (*Mém. de la Soc. Roy. de Méd. de Paris*, t. iv. p. 261). Two ounces and a half have been found to produce very little effect on a cow; while twice that quantity caused dysentery, which continued seventeen days. On the horse, from six to twelve drachms have merely rendered the stools somewhat softer and more frequent, although shivering, loss of appetite, irregularity of pulse, great anxiety, and other alarming constitutional symptoms, were brought on (Moiroud, *Pharm. Vét.* p. 267-8). On the other hand, Viborg (Wibmer, *Wirk. der Arzneim. ü. Gifte.* ii. 389) has given an ounce to the horse without any remarkable effect.

(*b.*) *On man.*—Taken in *small doses*, gamboge promotes the secretions of the alimentary canal and of the kidneys, and causes more frequent and liquid stools than natural. In *larger doses* it occasions nausea, oftentimes vomiting, griping pains of the bowels, watery stools, and increased discharge of urine. When the action is very violent, there is great depression of the vascular system. In *excessive doses* it acts as an acrid poison. A drachm caused horrible vomiting and purging, followed by syncope and death (Paullini, *Eph. Nat. Cur.* Dec. i. Ann. viii. p. 139). The deaths which have occurred from the use of enormous quantities of Morison's pills (see *Lond. Med. Gaz.* vol. xiv. 612 and 759; xvii. 357, 415, and 623; xviii. 75 and 927; and xix. 976) are mainly ascribable to the gamboge contained in these medicines. In these cases the symptoms were, violent vomiting and purging, abdominal pain and tenderness, cold extremities, and sinking pulse. On *post-mortem* examination, inflammation, ulceration, and mortification of the intestines, were found.

Gamboge belongs to the active hydragogues and drastic purgatives. Its activity is inferior to elaterium and croton oil. In acridity it exceeds jalap, scammony, and even colocynth. In its mode of operation it is allied to, though scarcely so acrid as, euphorbium. It is exceedingly apt to irritate the stomach, and to occasion nausea and vomiting. This arises from its ready solubility in the gastric juices. As this action on the stomach is exceedingly objectionable, we sometimes endeavour to lessen it by conjoining aloes, or some other substance which diminishes the solubility of gamboge in aqueous fluids, and by giving the medicine in the form of pill. Sundelin (*Heilmittell*, ii. 28, 3[te] Aufl.) ascribes to gamboge an especial power of exciting the vascular system (arteries and veins) of the pelvic organs, in virtue of which, he says, it readily gives rise to the hemorrhoidal flux and uterine hemorrhage. Furthermore, he regards it as powerfully irritating and exciting to the abdominal nerves, especially the sacral and pelvic divisions.

Uses.—From the foregoing account of the effects of gamboge, it is very evident that it is a remedy well adapted for acting as a stimulus to the abdominal and pelvic viscera, either to rouse them when in a torpid state, or to give them preternatural activity, and thereby to relieve some distant organ, on the principle of counter-irritation. On the other hand, the use of gamboge is highly objectionable when there is an irritable or inflammatory condition of the stomach or bowels, a tendency to abortion, or to uterine hemorrhage, and also when we do not want to promote or increase the hemorrhoidal discharge. The following are some of the cases in which we employ it:—

1. *In constipation*, where an active cathartic of small bulk is required, gamboge is employed. It is, however, not given alone, as the necessary dose would be very apt to create nausea and vomiting. It is, therefore, usually conjoined with other and milder purgatives, the operation of

which it increases and quickens, while they, by diminishing its solubility in the juices of the stomach, lessen its tendency to create nausea or vomiting. The *pilulæ catharticæ compositæ*, Ph. U. S. (see p. 472), and the *pilulæ cambogiæ compositæ*, L. D. (p. 1232), may be referred to as preparations in which these objects have been kept in view.

2. *In cerebral affections*, as apoplexy, or a tendency thereto, gamboge, usually associated with other purgatives as above stated, is a highly valuable counter-irritant purgative. By stimulating and rousing the nerves, blood-vessels, and secretory apparatus of the abdomen, it is often calculated to relieve determinations of blood to other parts.

3. *In dropsies* gamboge has been employed, on account of its hydragogue operation, where the use of drastic purgatives is indicated. To its efficacy numerous practitioners have borne testimony. It is, however, rarely given alone, but usually in combination with other and milder remedies (as jalap and bitartrate of potash) of the same class. If it be desirable to act also on the kidneys, an alkaline solution of gamboge has been recommended. Gamboge has been thought more especially serviceable in those forms of dropsy connected with hepatic obstruction.

4. *As an anthelmintic.*—Gamboge has been frequently employed as a remedy for tape-worm, and not unfrequently with considerable success. Several empirical anthelmintic remedies (see Murray, *App. Med.* iv. 121 et seq.) are said to owe their efficacy to this substance. It is an important constituent of Madame Nouffer's *specific* (see p. 578).

Administration.—On account of its tendency to occasion vomiting and griping, gamboge is usually given in small *doses*, as from one to three or four grains, in the form of pill, and repeated every four or six hours. In this way it may be given with safety and without inconvenience. The full dose of it is said to be from ten to fifteen grains. An alkaline solution of gamboge has been long known on the continent under the name of *tincture of gamboge* (*tinctura gummi guttæ*, in Voigtel's *Arzneim.* Bd. ii. Abt. ii. S. 203) and has been employed as a powerful diuretic in dropsy. It consists of gamboge, in powder, ℥ss.; carbonate of potash, ℥j. (intimately mixed with the gamboge); and brandy, ʒxij. Digest with a gentle heat for four days. Dose fʒss. to f℥j.

Pilulæ Cambogiæ compositæ, L. D. *Pilulæ Cambogiæ*, E.—(Gamboge, bruised, ʒj. [℥j. *E.*]; Aloes bruised, ʒiss. [East Indian or Barbadoes Aloes, ℥j. *E.*—Hepatic Aloes, ʒiss. *D.*]; Ginger, bruised, ʒss. [Aromatic powder, ℥j. *E.*]; Castile Soap, ʒij. [℥ij. *E.*] Mix the powders together, then add the soap [and then a sufficiency of syrup, *E.* treacle, *D.*] and beat them into one mass). Cathartic; considerably more active than the *pilulæ alöes compositæ* (p. 649). Employed in obstinate constipation. Dose, grs. x. to grs. xv.—The aloes, by diminishing the solubility of the gamboge, renders the latter less likely to irritate the stomach. The formula is said to be a simplification of one proposed by Dr. George Fordyce.

Antidote.—In poisoning by gamboge our chief reliance must be placed on the palliatives already mentioned for poisoning by euphorbium (p. 775) and elaterium (p. 1088). I am acquainted with no well-ascertained antidote, though the alkalies (carbonate of potash, according to Hahnemann, *Hufeland's Journ.* Bd. v. S. 12.) have been said to diminish the violence of the topical action of gamboge.

Canel'la al'ba, Murray, L. E. D.—*Laurel-leaved Canella* or *Wild Cinnamon.*

Sex. Syst. Decandria, Monogynia.

(Cortex, *L. D.*—Bark, *E.*)

History.—The bark of this tree has been frequently confounded with that of *Drimys Winteri.* Clusius (*Exot.* lib. iv. cap. i. p. 75, and cap. iii. p. 78) describes both barks, and notices two kinds of canella bark.

Botany. *Gen. Char.*—*Sepals* five. *Petals* five. Somewhat coriaceous, glaucous-blue, contorted in æstivation. *Stamens* united to form a tube; *anthers* fifteen, resembling furrows. *Stigmas* three. *Berry* three-celled, or by abortion one-celled; cells one- or two-seeded. *Embryo* (according to Gærtner, but perhaps an error) surrounded by fleshy albumen, curved, with linear cotyledons (*Decandolle*).

Sp. Char.—The only species.

A *tree* growing from ten to fifty feet high. *Leaves* alternate, shining, obovate, cuneate at the base, coriaceous and opaque when old, dotted when young. *Flowers* small, clustered purple. *Berry* the size of a pea, fleshy, smooth, blue or black (Swartz, *Trans. Linn. Soc.* i. 96).

Hab.—West Indies and continent of America.

Description.—The canella bark of the shops (*cortex canellæ albæ*), sometimes termed, on the continent, *costus dulcis*, or *costus corticosus*, is the inner bark of the stem and branches. It occurs in quills or broken pieces, which are hard, somewhat twisted, of a yellowish-white or pale orange-colour, somewhat lighter on the internal surface, and have an aromatic clove-like odour, an acrid peppery taste, and a white granular fracture.

J. Bauhin and others have confounded it with *Winter's bark:* hence it has been denominated *spurious Winter's bark* (*cortex Winteranus spurius*). The pale colour of its inner surface is one out of several physical characters by which the two barks may be distinguished. Chemically, they may be distinguished by nitrate of baryta and sulphate of iron, both of which cause precipitates in the infusion of Winter's bark, but not in that of Canella (*Journ. de Pharm.* t. v. p. 481).

Composition.—Canella bark was analyzed, in 1820, by Henry (*Ibid.*), and in 1823 by Petroz and Robinet (*op. cit.* vol. viii. p. 197).

Henry's Analysis.	*Petroz and Robinet's Analysis.*
Volatile oil.	Volatile oil.
Aromatic resin.	Resin.
Brownish yellow colouring-matter.	Bitter extractive.
Extractive.	*Canellin.*
Gum.	Gum.
Starch.	Starch.
Albumen.	Albumen.
Lignin.	Lignin.
Salts.	Salts.
Canella bark.	Canella bark.

1. *Volatile Oil of Canella bark.*—According to Cartheuser it is dark yellow, fluid, and heavier than water. It has an acrid taste.

2. *Resin.*—Henry found this constituent to be aromatic, but not acrid.

3. *Bitter Extractive.*—Brown, very bitter, not crystallizable. Soluble in alcohol, ether, and slightly in water.

4. *Canellin* (*Mannite?*). — A crystallizable, saccharine substance, incapable of undergoing the vinous fermentation.

Physiological Effects.—Canella bark is an aromatic stimulant and tonic. Its aromatic qualities depend on the oil and resin; its tonic properties on its bitter principle. As an aromatic it ranks between cinnamon and cloves.

Uses.—In this country it is employed principally as an aromatic addition to purgatives and tonics (see *pulvis aloës cum canellâ*, D., and *vinum aloes*, p. 650; and *tinctura gentianæ composita*, E. p. 897, and *vinum gentianæ*, E.); and is well adapted for debilitated conditions of the digestive organs.

By the Caribs (the ancient natives of the Antilles) and the negroes of the West Indies, it is employed as a condiment. It has been considered useful in scurvy.

Administration.—Dose of the powder, grs. x. to ʒss.

Vinum Gentianæ, E. (Gentian, in coarse powder, ℥ss.; Yellow Bark, in coarse powder, ℥j.; Bitter-Orange peel, dried and sliced, ʒij.; Canella, in coarse powder, ʒj.; Proof-spirit, f℥ivss.; Sherry, Oj. and f℥xvj. Digest the root and barks for twenty-four hours in the spirit; add the wine, and digest for seven days more; strain and express the residuum strongly, and filter the liquors). This formula should have been introduced at p. 897.—Wine of gentian is an aromatic tonic, useful in dyspepsia and anorexia. It is apt to become acetous by keeping. The dose of it is fʒss. to f℥j.

Order 67. Aurantia'ceæ *Corréa.*—The Orange Tribe.

Essential Character.—*Calyx* urceolate or campanulate, somewhat adhering to the disk, short, three- or five-toothed, withering. *Petals* three to five, broad at the base, sometimes distinct, sometimes slightly combined, inserted upon the outside of a hypogynous disk, slightly imbricated at the edges. *Stamens* equal in number to the petals, or twice as many, or some multiple of their number, inserted upon a hypogynous disk; *filaments* flattened at the base, sometimes distinct, sometimes combined in one or several parcels; *anthers* terminal, innate. *Ovary* many-celled; *style* one, taper; *stigma* slightly divided, thickish. *Fruit* pulpy, many-celled, with a leathery rind replete with receptacles of volatile oil, and sometimes separable from the cells; *cells* often filled with pulp. *Seeds* attached to the axis, sometimes numerous, sometimes solitary, usually pendulous, occasionally containing more embryos than one; *raphe* and *chalaza* usually very distinctly marked; *embryo* straight; *cotyledons* thick, fleshy; *plumule* conspicuous.—*Trees* or *shrubs*, almost always smooth, and filled every where with little transparent receptacles of volatile oil. *Leaves* alternate, often compound, always articulated with the petiole, which is frequently winged. *Spines*, if present, axillary (*Lindley*).

Properties.—In the bark, leaves, flowers, and rind of the fruit, are numerous vesicular or rounded reservoirs, which contain a highly fragrant volatile oil. Pulp of the fruit acidulous and refrigerant.

Ci'trus med'ica, Risso, E.*—*The Citron-Tree.*

Sex. Syst. Polyadelphia, Polyandria.

History.—The fruit of this species is supposed to be the μῆλον μηδικὸν of Theophrastus (*Hist. Plant.* i. 22, and iv. 4). Pliny (*Hist. Nat.* xv.

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* In the Edinburgh Pharmacopœia, 1839, *Lemons* are referred to *Citrus medica*, Risso. This is obviously a mistake.

14, ed. Valp.) calls it *malum citreum*. It is probable that the citron is referred to in the Old Testament on several occasions (*Cant.* ii., vii., and viii.; *Joel* i.) where, in our translation, the word apple has been employed (Carpenter, *Script. Nat. Hist.*)

BOTANY. *GEN. CHAR.*—*Flowers* usually with a quinary proportion of parts. *Calyx* urceolate, three- to five-cleft. *Petals* five to eight. *Stamens* twenty to sixty; *filaments* compressed, more or less united at the base, polyadelphous; *anthers* oblong. *Style* terete; *stigma* hemispherical. *Fruit* baccate, seven- to twelve-celled; cells many-seeded, pulpy. *Spermoderms* (seed coats) membranous; auricles of the *cotyledons* very short (D. C.)—*Trees* or *shrubs*, with axillary spines. *Leaves* reduced to one terminal leaflet at the apex of the petiole, often winged. The *rind* of the fruit is regarded by Decandolle as a kind of torus, by Dr. Lindley as the union of the epicarp and sarcocarp. In the external yellow portion (*flavedo* or *zeste*) of it are the rounded or vesicular receptacles containing volatile oil; the inner white portion is spongy. The *cells* of the fruit are filled with small pulpy bags, readily separable from each other, and containing the acid juice. *Seeds* exalbuminous, marked externally with the raphe; inner coat stained at one extremity, indicating the place of the chalaza.

FIG. 228.

Citrus medica.

SP. CHAR.—*Petioles* naked. *Leaves* oblong, acute. *Flowers* with forty anthers, often without pistils. *Fruit* oblong, rugous, with a thick rind and acidulous pulp (*D. C.*)—*Tree.* Young *branches* violet. *Leaves* subserrate. *Petals* externally purplish. *Fruit* large, violet-red when young, fine yellow when mature; its rind adherent, with an agreeable odour. Risso (*Ann. du Mus. d'Hist. Nat.* xx.) enumerates three varieties.

HAB.—A native of Asia. Cultivated in the South of Europe.

DESCRIPTION, &c.—The fruit of this tree is the *citron* (*malum citreum*). It sometimes attains a weight of more than 20 lbs. Those fruits which preserve their pistilla are called *pitima*. Risso says they are sought after by the Jews, who suspend them to palms at the feast of the tabernacle. The flavedo of the citron abounds in volatile oil, which may be obtained either by expression or distillation. The leaves, as also the flowers, of the citron-tree, yield a volatile oil by distillation (Raybaud, *Journ. de Pharm.* Août 1834, p. 437). The leaves are interposed between linen, to which they communicate a fragrant odour: moreover they are said to keep away insects.

Two volatile oils, known respectively as the *essence* or *essential oil of citron*, and the *essence* or *essential oil of cedra*, are employed in perfumery. Both are highly fragrant, almost colourless, and lighter than water. They are distinguished by their odour: that of the essence of cedra combining the odours of citron and bergamot. These two oils are usually confounded by pharmacological writers. From their apparent freedom from mucilage I presume both have been procured by distillation. The composition of one of these has been ascertained, by Dumas (*Traité de Chimie*, v. 672), to be identical with that of the essential oil of lemons—viz. $C^{10} H^{8}$.

PHYSIOLOGICAL EFFECTS AND USES.—Analogous to those of the orange and lemon. The fruit is seldom brought to the table in the raw state, but it yields some excellent preserves and sweatmeats. The juice is employed to flavour punch and negus. It forms, with sugar and water, a refreshing, refrigerant beverage. The essential oil is used in perfumery, and may be employed in medicine for scenting.

Ci'trus Berga'mia, Risso.—*The Bergamot Citrus.*

Citrus Limetta Bergamium, *L.*—Citrus Limetta, *E.*

Sex. Syst. Polyadelphia, Polyandria.

(Oleum è fructûs cortice destillatum, *L.*—Volatile oil of the rind of the fruit, *E.*)

BOTANY. *GEN. CHAR.*—See CITRUS MEDICA.

SP. CHAR.—*Leaves* oblong, more or less elongated, acute or obtuse. under-side somewhat pale. *Petiole* more or less winged or margined. *Flowers* usually small, white. *Fruit* pale yellow, pyriform or depressed; rind with concave receptacles of oil; pulp more or less acid (Wight and Arnott).

HAB.—Cultivated in the South of Europe.

DESCRIPTION.—The *volatile oil* or *essence* of *bergamot* (*oleum bergamii, oleum bergamotæ*), imported from the South of Europe, is procured from the rind of the fruit. It may be obtained either by expression (as the volatile oil of lemons) or by distillation (Raybaud, *Journ de Pharm.* Août 1834). It is pale greenish yellow, with a remarkable odour, and a sp. gr. of 0·885. Its composition is identical with that of oil of lemons, being $C^{10} H^8$.

USES.—Oil of bergamot is employed as a perfume only. It is a useful odoriferous adjunct to unguents.

Ci'trus Limo'num, Risso, L. E.—*The Lemon-tree.*

Ci'trus med'ica, *D.*

(Fructus. Fructûs cortex exterior. Oleum è fructûs cortice exteriori destillatum. Succus, *L.*—Fruit. Rind of the fruit. Volatile oil of the rind of the fruit, *E.*—Fructûs succus, tunica exterior et ejus oleum volatile, *D.*)

HISTORY.—It is supposed that the Greeks and Romans were unacquainted with the Orange and Lemon, which only became known to Europeans at the time of the Crusades (Macfadyen, in Hooker's *Bot. Miscel.* vol. i. p. 299). This supposition receives confirmation from the fact, "that the Persian and Arabian authors do not, as is their wont, give any Greek synonyme of either, but of the citron, which is supposed to have been known to the Romans" (Royle, *Illustr.* p. 130).

FIG. 229.

Citrus Limonum

BOTANY. *GEN. CHAR.* — See CITRUS MEDICA.

SP. CHAR. — Young *branches* flexible. *Leaves* oval or oblong, usually toothed. *Petiole* simply margined. *Flowers* white, tinged with red. *Fruit* yellow, ovoid or rarely globular; terminated by a more or less elongated knob; rind with convex vesicles of oil; pulp acid (Wight and Arnott).

HAB.—A native of Asia (Himalaya, *Royle*; Persia, *Risso*). Cultivated in the South of Europe.

Description.—Lemons (*limones*) are imported from Spain, Portugal, Italy, and the Azores, packed in chests, each lemon being separately rolled in paper. The Spanish lemons are most esteemed. We employ in medicine both *the rind* and *the juice*.

1. *Lemon Peel* (*Cortex Limonum*).—The flavedo (*flavedo corticis limonum*) is pale-yellow and rough. By drying its colour deepens. Its taste is aromatic and bitter; its odour, which is owing to the volatile oil lodged in appropriate receptacles, is strong and peculiar. The inner portion of the cortex is white, spongy, and almost both odourless and tasteless. The flavedo yields, both by distillation and expression, a volatile oil (*essential oil of lemons*). A watery infusion of lemon peel becomes greenish-brown on the addition of the sesquichloride of iron.

2. *Lemon Juice* (*Succus Limonum*).—A slightly turbid, very sour liquor, with a grateful flavour, obtained from lemons by expression and straining. Owing to the mucilage and extractive which it contains, it readily undergoes decomposition, though various methods have been proposed of preserving it. On this account an *artificial lemon juice* has been proposed as a substitute. It consists of Water, f℥xvj.; Citric Acid, ℥viijss.; Oil of Lemon, a sufficient quantity to communicate the proper flavour. The juice both of lemons and limes (the fruit of *Citrus Lima*, Macfadyen, or *C. acida*, Roxburgh) is extensively imported. In 1839, duty of one halfpenny per gallon was paid on 37,338 gallons of these juices. In the West Indies *lime juice* is preferred to lemon juice.

Composition.—1. *Lemon Peel* has not been regularly analyzed, though some of its constituents have been examined. It contains *volatile oil*, *hesperidin*, *a bitter principle*, and *gallic acid*.

1. *Volatile Oil of Lemons; Essence of Lemon* (*Oleum Limonum*).—This oil is usually procured by expression, as follows:—The flavedo of the lemons is removed by rasping, and is afterwards expressed in hair sacks. The oil which is thus procured is received in flasks, where it deposits some of its impurities, and is then decanted and filtered (Henry and Guibourt, *Pharm. Raison.* t. i. p. 284, 2me ed.) Baumé (*Elém. de Pharm.* t. i. p. 486) says the rasped flavedo is pressed between glass plates. Expressed oil of lemons is somewhat turbid, and liable to undergo change by keeping, owing to the mucilaginous matter which it contains in solution. Oil of lemons may be procured also by distillation; and the oil thus procured is pure, not disposed to undergo change by keeping, and is employed, under the name of *scouring drops*, for removing grease spots from silks and other textures; but its flavour is less pleasant and sweet. The greater part of the oil of commerce is brought from Portugal and Italy; some, however, is procured from France. When quite pure, it is colourless, limpid, and of a fragrant odour, like that of lemons. Its sp. gr. at 70° F. is 0·847. It is soluble in all proportions in anhydrous alcohol, and it boils at about 345° F. When the commercial oil is exposed to a temperature of —4° F. it deposits white crystals, whose nature is not known: the rectified oil remains perfectly liquid and transparent at this temperature. Oil of lemons is composed of two isomeric oils,—one (*citrene*, Dumas; *citronyle*, Blanchet and Sell) capable of forming, with hydrochloric acid, a crystalline compound (composed of $C^{10} H^8 + H Chl.$); the other (*citryle*) not forming any crystalline compound with this acid. The composition of oil of lemons is $C^{10} H^8$—*i. e.* identical with that of the oil of turpentine (p. 710), juniper (p. 723), savin (p. 724), copaiva (p. 1175), bergamot (p. 1236), and citron (p. 1235). (For some interesting observations on this and some other oils of this order, see Soubeiran and Capitaine, *Journ. de Pharm.* xxvi. 1 & 66).

2. *Hesperidin.*—A crystallizable, neutral, resinous (?) principle, which resides in the white portion of the rind of the fruit of the genus *Citrus*. It has the form of silky needles, which are odourless and tasteless, when pure, though they usually possess slight bitterness, probably from the presence of another principle. It is fusible, slightly soluble in water, but more so in alcohol; insoluble in ether, and the oils both fixed and volatile. Oil of vitriol reddens it (Lebreton, *Journ. de Pharm.* xiv. 377).

3. *Bitter Matter* (*Aurantiin*).—This is referred to the class of substances vaguely

denominated extractive. It is the presence of this substance which enables an aqueous solution of impure hesperidin to form a reddish-brown precipitate with the persalts of iron. It frequently contains traces of gallic acid.

2. *Lemon Juice.*—According to Proust, *lemon juice* consists of *citric acid*, 1·77; *malic acid*, *gum*, and *bitter extractive*, 0·72; and *water*, 97·51. *Lime juice* contains the same ingredients, in somewhat different proportions: the quantity of citric acid in it is larger, while that of mucilage, &c. is less.

Citric Acid (*Acidum Citricum*).—First procured in the solid state, in 1781, by Scheele. It is found in many acid juices of fruits usually free, but sometimes in combination with either potash or lime. Besides the fruits of the genus *Citrus*, it is found, with little or no malic acid, in the fruits of Dulcamara, Dog-rose, Cranberry, Bird Cherry, and Whortleberry. Mixed with an equal quantity of malic acid, it is found in the Gooseberry, Red Currant, Strawberry, Raspberry, Cherry, &c. In the Tamarind it exists with both malic and tartaric acids (see p. 1161).

Citric acid crystallizes in colourless, odourless, very sour, transparent, short, rhomboidal prisms, whose extremities are terminated by four trapezoidal faces, and whose primary form is the right rhombic prism. Crystallized citric acid becomes damp by exposure to a moist atmosphere, though Dumas and other French chemists state it to be unalterable by the air. According to Vauquelin it is soluble in seventy-five parts of cold and fifty of boiling water. The solution is strongly acid, and becomes mouldy by keeping. Crystallized citric acid is much less soluble in alcohol than in water. Its sp. gr. is 1·617. When heated to about 212° F. it fuses into a limpid liquor. By distillation it gives two pyrogenous acids. One of these, called *pyrocitric* or *citribic acid*, was discovered by Lassaigne, and consists, according to Dumas, of $C^5 H^2 O^3$; the other, termed *citricic acid*, was discovered by Baup, and is isomeric with the first. During the operation, acetone (pyroacetic spirit) and much carbonic oxide are produced. Heated with potash to about 390°, it is converted into oxalic acid. Treated with oil of vitriol, it evolves sulphurous acid, carbonic acid, carbonic oxide, and acetic acid. Heated with nitric acid, it becomes oxalic acid.

The *characteristics* of citric acid are as follows:—It yields, when added in excess, no precipitate with lime-water. It does not yield a crystalline precipitate when an excess of it is added to a solution of carbonate of potash. It yields, with barytic water, a white precipitate (*citrate of baryta*). With a solution of acetate of lead it also furnishes a white precipitate (*citrate of lead*), soluble in ammonia, which forms with it a double salt (*ammoniacal citrate of lead*). With a solution of nitrate of silver it produces a white precipitate (*citrate of silver*), which, when heated, becomes brown, froths up, deflagrates, discharges white fumes, and leaves an abundant, ash-grey, coarsely fibrous, crumbly residue, which by heat becomes pure silver.

Citric acid has the following composition:—

				Crystals by cooling a Solution saturated at 212°.				*Commercial Cystals.*		
	Atoms.	Eq.Wt.	Per Cent.		Atoms.	Eq.Wt.	Per Cent.	Atoms.	Eq.Wt.	Per Cent.
Carbon	4	24	41·38	Anhydrous citric acid	1	58	86·57	1	58	82·86
Hydrogen	2	2	3·44	Water	1	9	13·43	$1\frac{1}{3}$	12	17·14
Oxygen	4	32	55·18							
Anhydrous citric acid	1	58	100·00	Crystallized citric acid	1	67	100·00	1	70	100·00

Physiological Effects and Uses. 1. *Of the Lemon Peel.*—Lemon peel is a grateful stomachic and aromatic. It is employed more as a flavouring ingredient than for its own proper effects. It is a constituent of the *infusum gentianæ compositum* (p. 896), and of the *infusum aurantii compositum*. *Candied lemon peel* (*cortex limonum conditus*) is an agreeable stomachic, and is employed as a dessert and in confectionary.

2. *Of Oil of Lemons.*—Oil or essence of lemons possesses the stimulant properties of the milder volatile oils, and is denominated carminative and diaphoretic. In full doses it is said to be apt to occasion head-

ache and giddiness. Its principal use is for communicating an agreeable odour and flavour to other medicines. It may be taken as a carminative, in the dose of a few drops, on sugar (*elæosaccharum limonum*). As a perfume, it is an exceedingly useful adjunct to sulphur ointment, and to evaporating lotions. To this, as to some other volatile oils (see *oleum rosmarini*, p. 831), has been ascribed the power of promoting the growth of the hair, and, in consequence, it has been added to pomatum. More recently it has been employed as a stimulant application in various external inflammations of the eye. It was first used in these diseases by Dr. Wörlitz (Dierbach, *Neuest. Entd. in d. Mat. Med.* Bd. 1. S. 78, 1837; also *Lond. Med. and Phys. Journ.* for 1830, vol. viii. N. S. p. 366), who applied it by squeezing the little drops of oil from the rind of the lemon into the eye. He used it with good effect in rheumatic, catarrhal, and scrofulous inflammations of the eye, in pannus and pterygium, and in opacity and some other consequences of inflammation of the cornea. It has since been tried by Mr. Foote (*Trans. of the Med. Bot. Soc.* 1832-33, p. 73), at the Ophthalmic Hospital, who dropped the oil into the eye in the same way that the *vinum opii* is applied. In some cases it caused excessive pain. He thinks it preferable to the vinum opii, in all cases where a stimulant is required.

3. *Of Lemon Juice.*—Lemon juice furnishes a most agreeable and refreshing beverage, and proves refrigerant and antiscorbutic. It is employed for several purposes, as follows:—

(*a.*) *In the preparation of refrigerant drinks.*—It may be either added to barley-water or mixed with sugar and water, to form *lemonade*. The latter may be extemporaneously made, by adding two lemons sliced, and two ounces of sugar to two pints of boiling water, and digesting until cold. A similar beverage is called, by Mr. Brande (*Dict. of Pharm.* 341), *King's Cup*. These acidulated drinks are exceedingly useful for allaying thirst, and as refrigerants in febrile and inflammatory complaints, and in hemorrhages. In the latter maladies *iced lemonade* should be preferred. Where there is nausea or a tendency to sickness, *effervescent lemonade* is useful. "Lemonade, as a beverage in putrid diseases, was first introduced by the French physicians in the beginning of the seventeenth century; and about the year 1660, an Italian from Florence, having learnt a process of freezing confectionary, conceived the happy idea of converting such beverage into ice. This found a ready sale, and was the occasion of so great an increase in the number of sellers of lemonade, that in the year 1676 the *Lemonadiers* of Paris were formed into a company, and received a patent from the Government" (Dr. Paris, *Pharmacol.* ii. 301, 6th ed.)

(*b.*) *In the formation of the effervescing draught.*—The effervescing draught, made with lemon juice (or citric acid) and bicarbonate of potash, is one of the best remedies we possess for allaying sickness and vomiting (see p. 303). The citrate of potash which is formed is a mild diaphoretic and diuretic, and often allays restlessness and watchfulness in fever. It is adapted for lithic acid deposits; but, like other remedies of the same class, is objectionable in phosphatic deposits (see p. 329). When our object is to determine to the skin, an effervescing draught, composed of lemon juice or citric acid and sesquicarbonate of ammonia, is to be preferred. The relative proportions of the alkaline carbonates, and of lemon juice or citric acid, for the formation of effervescent draughts, is as follows:—

Citric Acid.		*Lemon Juice.*		*A scruple of the Alkali.*
Grs. 14	or	f℥iiiss.	... .	Bicarbonate of Potash.
Grs. 17	or	f℥iv.	....	Carbonate of Potash.
Grs. 24	or	f℥vj.	....	Sesquicarbonate of Ammonia.

Effervescing draughts are exceedingly valuable vehicles for the exhibition of other remedies.

c. As an Antiscorbutic.—Lemon juice has long been regarded as an invaluable antiscorbutic; but on account of the difficulty of preserving it, crystallized citric acid is usually substituted. "Those only," says Sir Gilbert Blane (*Select Dissert.* p. 8, 1822; see also *Observ. on the Diseases incident to Seamen*), "who have made themselves acquainted with the early part of the naval history of this country, or those who have perused the interesting, popular, and eloquent narrative of Commodore Anson's voyage, can duly appreciate the value of this simple remedy." Yet, on hypothetical grounds, Dr. Stevens (*On the Blood*) ventures to assert that citric acid induces scurvy!

d. As an Antidote.—In poisoning by the alkalies and their carbonates, the vegetable acids are the antidotes, and the most convenient and easily procurable acidulous substances are, in general, vinegar and lemon juice.

e. As an Anti-narcotic.—In poisoning by narcotic substances, as opium, lemon juice may be administered, after the poison has been removed from the stomach, to counteract the effects.

f. Other Uses.—Several of the medicinal uses of lemon juice can only receive a passing notice. Such are the employment of it, with common salt, in *dysentery*, *remittent fever*, *bellyache*, and *putrid sore-throat*, as recommended by Dr. Wright (*Mem. of the late Dr. Wright*, p. 322);—its use in *cardialgia*, by Dr. Dewees; and in *syphilis*, by Dr. Rollo. As *a topical remedy for uterine hemorrhage* after delivery, Dr. Evratt (*Arch. Gen. de Méd.* Janv. 1825, p. 141) recommends that a cut peeled lemon be introduced into the uterus, and the juice there expressed. It causes the uterine contractions by which the juice is expelled, and the hemorrhage stopped. In *hospital gangrene*, Dr. Werneck (Dierbach, *Neuest. Entd. in d. Mat. Med.* 2te Abt. S. 512, 1828) applied, with good effect, in the first stage of the disease, either lint soaked in lemon juice, or segments of lemons.

Administration.—The mode of employing lemons will be obvious from the preceding remarks.

1. *Acidum Citricum.* L. E. D.—(Lemon Juice, Oiv.; Prepared Chalk, ℥ivss.; Diluted Sulphuric Acid f℥xxviiss.; Distilled Water, Oij. Add the Chalk gradually to the Lemon Juice made hot, and mix. Set by, that the powder may subside; afterwards pour off the supernatant liquor. Wash the Citrate of Lime frequently with warm water. Then pour upon it the diluted Sulphuric acid and the distilled Water, and boil for a quarter of an hour. Press the liquor strongly through linen, and strain it; evaporate the strained liquor with a gentle heat, and set it by, that crystals may be formed. Dissolve the crystals, that they may be pure, again and a third time in water, and strain the solution as often; boil down and set it aside, *L.*—The processes of the *Edinburgh* and *Dublin Colleges* are essentially the same. The *Edinburgh College* boils the juice

twice, and allows it to rest once before the chalk is added. After the sulphuric acid has been added, the filtered liquor is directed to be tested with nitrate of barytes, and if the precipitate thereby obtained be not "almost entirely soluble in nitric acid," more citrate of lime is to be added [to saturate the great excess of sulphuric acid].—The *Dublin College* employs diluted sulphuric acid equal in weight to eight times the chalk employed).

The juice of lemons and limes is imported for citric acid manufacturers, in pipes and hogsheads. It is saturated with chalk or whiting in a large vat. By this means a citrate of lime is formed. This is precipitated, while the carbonic acid of the chalk escapes, and the mucilage of the juice for the most part remains in solution.

INGREDIENTS.		PRODUCTS.
1 Chalk = 50	1 Carbonic acid 22	1 Carbonic acid gas 22
	1 Lime 28	
Lemon Juice	Water, mucilage, &c.	Water, mucilage, &c.
	1 Citric acid 58	1 Citrate of lime .. 86

The supernatant liquor is then drawn off, the citrate of lime passed through a sieve and frequently washed with warm water, until the mucilage and other soluble impurities are for the most part got rid of, and sulphuric acid diluted with water then added: sulphate of lime separates, and citric acid remains in solution.

INGREDIENTS.		PRODUCTS
1 Citrate of lime = 86	1 Citric acid 58	1 Citric acid 58
	1 Lime 28	
1 Sulphuric acid = 40		1 Sulphate of lime .. 68

The clear solution is then evaporated (manufacturers use for this purpose leaden boilers) and the concentrated solution set aside to crystallize. The crystals are afterwards purified by re-solution and re-crystallization. (For further details respecting the manufacture of this acid consult Parkes, *Chem. Essays*, vol. i. p. 539, 2nd ed. 1823.)

Powdered citric acid is sometimes *adulterated* with powdered tartaric acid. The fraud may be readily detected by dissolving the suspected acid in a small quantity of water, and adding cautiously to it a solution of carbonate of potash, taking care that the acid be in excess. If any tartaric acid be present, a white crystalline precipitate (*bitartrate of potash*) is formed. The directions of the London and Edinburgh Colleges for ascertaining the purity of the acid are as follows:—

This acid is soluble in water; what is precipitated from the solution by acetate of lead is dissolved by nitric acid. No salt of potash, except the tartrate, is precipitated by solution of citric acid. It is totally dissipated in the fire (*Ph. Lond.*)

The solubility of the plumbeous precipitate in nitric acid is to show the absence of sulphuric acid or a sulphate.

A solution, in four parts of water, is not precipitated by carbonate of potash: when incinerated with the aid of the red oxide of mercury, no ash is left, or a mere trace (*Ph. Ed.*)

The elements of citric acid (viz. oxygen, hydrogen, and carbon) are dissipated by a red heat. But this dissipation is promoted by an agent (*ex.* red oxide of mercury) capable of supplying oxygen without leaving any fixed residuum.

Orfila (*Toxicol. Gén.*) ranks citric acid among the irritant poisons; but

Drs. Christison and Coindet (Christison, *On Poisons*, p. 208, 3rd ed.) gave drachm doses to cats without observing that the animals suffered any inconvenience therefrom. The effects of large doses of this acid on man I am not acquainted with. Small quantities dissolved in water allay thirst, diminish preternatural heat, check profuse sweating, and promote the secretions of urine. Vogt (*Pharmakodyn.* Bd. ii. S. 72, 2te Aufl.) says it acts, more than tartaric acid, on the skin (in this respect being similar to acetic acid), and less on the alimentary canal and urinary organs. The continued employment of it causes disorders of the digestive organs.

The *uses* of this acid are analogous to those of lemon juice (p. 1239) as a substitute for which it is applied in medicine. Dr. Porter, of Bristol, has proposed a solution of it as a solvent for opium (see *Opium*).

2. *Syrupus Limonum*, L. E. D.—(Lemon juice strained [and freed from impurities by subsidence, *E. D.*], Oj.; Sugar, lb. ijss. [℥lviii. *D.*] Dissolve the sugar in the lemon juice, by the aid of a gentle heat, then set aside for twenty-four hours; afterwards remove the scum, and should there be any dregs, pour off the clear liquor).—Refrigerant. An agreeable adjunct to diluent drinks, as barley-water, in febrile and inflammatory complaints, and to gargles. Dose, fℨj. to fℨiv.

Ci'trus Auran'tium, Risso, L. E. D.—*The Common* or *Sweet Orange-Tree.*

Sex. Syst. Polyadelphia, Polyandria.

Fructus. Fructûs cortex exterior. Flores. Oleum è floribus destillatum, *L.*—Distilled water of the flowers. Volatile oil of the flowers, *E.*—Fructûs succus et tunica exterior. Flores. Folia, *D.*)

History.—It is somewhat uncertain when the sweet orange became known to Europe. The bitter orange, as well as the lemon, was known during the middle ages, but the sweet orange is supposed not to have been introduced until a period after this (Macfadyen, *Bot. Miscell.* i. 302).

Botany *Gen. Char.*—See Citrus medica.

Sp. Char.—*Leaves* oval, elongated, acute, sometimes slightly toothed; *petiole* more or less dilated and winged. *Flowers* white, large. *Fruit* orange-coloured, roundish or ovoid, usually depressed, rarely terminated by a small knob; *rind* with convex vesicles of oil; *pulp* sweet (Wight and Arnott).—A great number of sorts is known to gardeners. The *China orange* is the common orange of the markets and of the Portuguese. The *St. Michael's orange* is a small seedless variety. The *blood-red orange* has a reddish-yellow fruit, with a pulp irregularly mottled with crimson.

Fig. 230.

Citrus Aurantium.

Hab. — Asia; probably China. Cultivated in the South of Europe, the Azores, and the West Indies.

Description.—*Orange leaves* (*folia aurantii*) are feebly bitter. Their watery infusion is greenish and somewhat bitter. They contain a fragrant volatile oil, which is procured by distillation, and is called, in the shops, *essence de petit grain*. *Orange flowers* (*flores aurantii* seu *naphæ*), when fresh, are white. They are sometimes exported from the South of Europe, stratified with common salt, in barrels (Risso). Dried orange flowers are yellowish, and have an agreeable odour, which is less powerful than that of the fresh flowers. By distillation, orange flowers yield a fragrant volatile oil (*oleum Neroli; oleum aurantii*). *The small green fruits* (*fructus immaturus aurantii*) which fall during the great heats of the summer, are carefully collected and dried. They, as well as the unripe fruit of the next species, then form the *orange berries* (*baccæ aurantii*) of the shops. Their size does not exceed that of a cherry; their colour is dark greyish or greenish brown; they have an aromatic odour and a bitter taste. They are used for flavouring *Curaçoa*. When smoothed by a lathe, they constitute the *issue peas* of the shops: they are preferred to ordinary peas for keeping up the discharge of an issue, on account of their pleasant odour. An infusion of orange berries is rendered green by the sesquichloride of iron. By distillation, these berries yield a fragrant oil (the original *essence de petit grain*). *The ripe fruit*, or the *orange* (*aurantium; poma aurantiorum*), is imported in chests and boxes, each orange being separately packed in paper. The best come from the Azores and Spain; very good ones are also brought from Portugal, Italy, Malta, and other places. The *rind* is sometimes employed as a substitute for the rind of the bitter orange. It yields by distillation a fragrant volatile oil (*essential oil of sweet orange*).

COMPOSITION.—*ORANGE FLOWERS* were analyzed by Boullay (*Bull. de Pharm.* i. 337), and found to contain *volatile oil, bitter extractive, gum, acetic acid*, and *acetate of lime*.

ORANGE BERRIES were analyzed, in 1828, by Lebreton (*Journ. de Pharm.* xiv. 377), who found their constituents to be as follows:—*Volatile oil, sulphur, chlorophylle, fatty matter, hesperidin, bitter astringent matter*, with some traces of *gallic acid, citric and malic acids, citrates and malates of lime and potash, gum, albumen, lignin, mineral salts*, and traces of *iron* and *silica*. Widemann (*Ibid.* xvi. 707) obtained *a crystalline substance* analogous to, but yet different from, hesperidin.

ORANGE PEEL has not been analyzed; but its composition is, doubtless, analogous to that of lemon peel (p. 1237). *ORANGE JUICE* consists of *citric acid, malic acid, mucilage, albumen, sugar, citrate of lime*, and *water*.

1. *Volatile Oils from the Sweet Orange Tree.*—The volatile oils obtained from the leaves, flowers, and fruit-rind of the sweet orange tree, agree, in their essential chemical characters, with each other, with the corresponding oils obtained from the bitter orange, and with the volatile oil of lemons (see p. 1237). They differ principally in their odour.

The *oil of sweet orange* kept in the perfumers' shops is obtained by distillation with water, from the rind of the fruit.

The other volatile oils of this species are not distinguished in English commerce from those of the next species (see p. 1244).

2. *Hesperidin* } Described at p. 1237.
3. *Bitter principle* (*Aurantiin*) }

4. *Widemann's crystalline matter.*—Obtained from unripe oranges. Is distinguished from Hesperidin by its very distinct prismatic crystallization, by its insolubility in alcohol, by its solubility in water, and by its not forming oxalic acid with nitric acid.

PHYSIOLOGICAL EFFECTS AND USES.—*SWEET ORANGE-PEEL* is an aromatic stomachic and tonic analogous to lemon peel, and is occasionally employed as a substitute for the *bitter orange peel.* "Large quantities of it are sometimes productive of mischief, especially in children, in whom colic, and even convulsions, are sometimes induced by it. We have known the case of a child, in which death resulted from eating the rind of an orange" (*United States Dispensatory*). ORANGE JUICE is a refreshing and grateful beverage, and is extensively used at the table. In febrile and inflammatory complaints it is a valuable refrigerant;—allaying thirst and diminishing preternatural heat.

Ci'trus vulga'ris, Risso, L. E.—*The Bigarade* or *Bitter Orange Tree.*

Sex. Syst. Polyadelphia, Polyandria.

(Fructûs cortex exterior, *L.*—Distilled Water of the flowers, Rind of the fruit, Volatile oil of the flowers, *E.*)

HISTORY.—The bitter orange became known to Europe during the Middle Ages. All the old established orange groves of Spain, as those at Seville, planted by the Moors, are of the bitter orange. (Macfadyen, in *Hooker's Bot. Miscel.* i. 302).

FIG. 231.

Citrus vulgaris.

BOTANY. *GEN. CHAR.*—See *Citrus medica.*

SP. CHAR.—*Leaves* elliptical, acute or acuminated, slightly toothed. *Petiole* more or less winged. *Flowers* large, white. *Fruit* orange-coloured, roundish or slightly elongated or depressed; rind with concave vesicles of oil; pulp acid and bitter (Wight and Arnott).

Numerous varieties of this are cultivated. One of these yields the fruit known in the English market as the *Seville Orange.*

HAB.—Asia. Cultivated in Europe.

DESCRIPTION.—The *leaves* of this species, when rubbed, emit a very agreeable odour. Distilled with water they yield a bitter aromatic water, known in Languedoc as *eau de naphre* (*aqua naphæ*). At the same operation is procured a volatile oil, called the *essence de petit grain*, of finer quality than that obtained from the leaves of the sweet orange. The *flowers* yield, by distillation with water, *orange-flower water* (*aqua aurantii*, Ph. Ed.) and *oil of Neroli* (*oleum aurantii*, Ph. Ed.) of finer quality than the corresponding preparations obtained from the flowers of the sweet orange. The *unripe fruits*, like those of the sweet orange, are called *orange berries*, and are employed for the purposes before mentioned (p. 1243). The *Seville orange* is round and dark, and has an uneven, rugged, very bitter rind (*bitter orange-peel; cortex aurantii*, Ph. L. and Ed.), which is employed for medical purposes as well as in the preparation of *candied orange-peel*, and for flavouring the liqueur called *Curaçoa.*

COMPOSITION.—The composition of the *leaves*, *flowers*, and *fruit* of the bitter orange is doubtless analogous to that of the corresponding parts of the sweet orange.

1. *Oil of Orange-leaf; Essence de petit grain.*—The term *essence de petit grain* was originally applied to the volatile oil of the orange berry, which, however, readily underwent decomposition. It is now used to indicate the volatile oil obtained from the leaves both of the bitter and sweet orange. That procured from the bitter orange is of better quality than that from the sweet.

2. *Oil of Orange-flower; Oil of Neroli* (*Oleum Aurantii*).—Procured from the flowers of both the bitter and sweet orange; but that from the former is preferred. It is obtained by submitting the flowers, with water, to distillation; and it is found floating on the water in the receiver. It has an aromatic and fragrant odour, somewhat different from that of the flower. "It appears to me," says Soubeiran (*Nouv. Traité de Pharm.* i. 454), "to be a product of the alteration of the natural essential oil. The latter is more soluble than the neroli oil, and remains in solution in the water. Its presence may be demonstrated by agitating the distilled water with ether deprived of alcohol. By spontaneous evaporation the etherial solution leaves behind an essential oil, which has absolutely the same odour as the flowers, and which dissolves in water." Oil of neroli, furnished me by one of the most respectable importers as genuine oil, has a reddish colour. I am informed that the *essence de petit grain* is frequently substituted for it.

3. *Oil of the Rind of the Bitter Orange.*—This is sold by perfumers as *essential oil of bitter orange.* It has a considerable resemblance to the oil of the sweet orange.

PHYSIOLOGICAL EFFECTS AND USES.—The *rind* of the Seville orange being considerably more bitter than that of the sweet orange, is to be regarded as more stomachic and tonic. Its uses are the same. Its principal value is as a flavouring agent.

1. *INFUSUM AURANTII COMPOSITUM*, L. D. *Infusum Aurantii*, D. (Bitter Orange-peel, dried, ℥ss. [ʒij. *D.*]; Fresh Lemon-peel, ʒij. [ʒj. *D.*]; Cloves, bruised, ℈j. [ʒss. *D.*]; Boiling [distilled] Water, Oj. [Oss. *D.*] Digest for a quarter of an hour in a vessel lightly covered, and strain [through linen or calico, *E.*])—An agreeable stomachic. It is an excellent vehicle for the exhibition of various other medicines, as saline purgatives, ammonia, bitter tinctures, &c. Dose, f℥j. to f℥ij.

2. *CONFECTIO AURANTII*, L. *Conserva Aurantii*, E. (Fresh Orange-peel separated by a rasp, lb. j.; Sugar, lb. iij. Beat the rind in a stone mortar, with a wooden pestle; then, the sugar being added, again beat them until they are thoroughly incorporated, *L.* Grate off the rind of bitter oranges, and beat it into a pulp, adding gradually thrice its weight of white sugar, *E.*)—An agreeable stomachic. Employed as an adjunct to bitter and purgative powders, which are to be formed into electuaries. It is a good vehicle for the exhibition of the sesquioxide of iron.

3. *SYRUPUS AURANTII*, L. E. D. *Syrup of Orange-peel.* (Fresh Bitter Orange-peel, ℥iiss. [℥viij. *D.*]; Boiling Water, Oj. [Ovj. wine measure, *D.*]; Pure Sugar, lb. iij. [lb. xivss. *D.*] Macerate the peel in the water for twelve hours, in a vessel lightly covered; then strain the liquor [if necessary, *E.*] and add the sugar [and dissolve with the aid of heat, *E.*]).—To avoid the volatilization of the essential oil, as little heat as possible should be employed in the process. An equally agreeable and efficacious syrup may be prepared by adding f℥j. of tincture of orange-peel to Oj. of simple syrup. Syrup of orange-peel is stomachic, but its principal use is for flavouring. Dose, f℥j. to fʒiij.

4. *TINCTURA AURANTII*, L. E. *Tincture of Orange-Peel.* (Bitter Orange-peel, dried, ℥iijss.; Proof Spirit, Oij. Macerate for fourteen [seven, *E.*] days [and express strongly, *E.*], and filter the liquor. "This tincture may be prepared by percolation, by cutting the peel into small fragments, macerating it in a little of the spirit for twelve hours, and beating the mass into a coarse pulp before putting it into the percolator," *E.*)—This preparation was accidentally omitted from the Dublin

Pharmacopœia. It is an agreeable stomachic, and is principally employed as a flavouring adjunct to decoctions and infusions (tonic or purgative), effervescing mixtures, &c. Dose, fʒj. to fʒiij.

5. *Aqua Florum Aurantii*, L. *Aqua Aurantii*, E. *Orange-flower Water.* (Orange-flowers, lb. x.; Proof Spirit, f℥vij.; Water, *Cong.* ij. Let a gallon distil, *L.*)—Orange-flower water is usually imported. That prepared from the flowers of the bitter orange possesses the most fragrant odour, but it is sometimes prepared from the flowers of the sweet orange. It contains free acetic acid, derived from the flowers; hence, if kept in a vessel of lead or copper, it acquires a metallic impregnation. The presence of lead in it has recently been pointed out by Mr. Squire (*Brit. Ann. of Med.* Jan. 1837, p. 15). The following are the characters of the pure orange-flower water:—

"Nearly colourless: unaffected by sulphuretted hydrogen."—*Ph. Ed.*

Sulphuretted hydrogen produces, with either lead or copper, a dark-coloured precipitate. Orange-flower water is employed in medicine, as well as in perfumery, on account of its agreeable odour.

Aqua Coloniensis; *Eau de Cologne; Cologne Water.*—A much admired perfume. Two varieties are known in the shops—the *French* and the *German*: the latter fetches the highest price. Both profess to be made by Farina. The recipes for making it are numerous. I subjoin one, which is said, by Trommsdorf (*Journ. d. Pharm.* xviii. 79), to be followed in the Cologne manufactories:—Oil of Neroli; Oil of Citron; Oil of Bergamot; Oil of Orange; Oil of Rosemary: of each twelve drops; Malabar Cardamoms, ʒj.; Rectified Spirit, Oj. Distil.—Eau de Cologne forms an agreeable evaporating lotion in headache, fever, &c. It should be applied by means of a single layer of linen.

Other Medicinal Aurantiaceæ.

The *Fero'nia Elephan'tum*, a large tree growing in most parts of India, yields a gum which is used for medicinal purposes by the practitioners of Lower India. It is an exudation of the stem, and closely resembles gum Arabic (Ainslie, *Mat. Ind.* i. 161). It is not improbable, therefore, that part of the *East India gum* brought to this country (see p. 1149) may be the produce of this tree.

Order 68. Ternströmia'ceæ, *Lindley*.—The Tea Tribe.

Though unable to do more than bestow a passing notice on *Tea*, I could not wholly omit all reference to this important and interesting substance. Two kinds of Tea plant are cultivated in our green-houses; the one called *Thea viridis* or *Green Tea*, the other *Thea Bohea* or *Black Tea*. Great discrepancy of opinion exists as to whether the different varieties of tea of commerce are obtained from one or from two species (see Royle's *Illustr.* p. 109; and Hooker, *Bot. Mag.* t. 3148). The well-known differences between green and black teas lend great support to the assertions of those who contend that these teas are obtained from different plants, growing in different provinces of China. Mr. Reeves's observations on this point (see Royle, *op. cit.*) appear to me to be exceedingly apposite. In commerce, two principal kinds of tea are distinguished,—the *Black* and *Green*: to the first belong *Bohea, Congou, Campoi, Souchong, Caper,* and *Pekoe;* to the latter, *Twankay, Hyson-skin, Hyson, Imperial,* and *Gunpowder.* Frank (Gmelin, *Handb. d. Chem.* ii. 1252) analyzed both black and green teas, and obtained the following results:—

Fig. 232.

Thea Bohea.

	Black.	*Green.*
Tannin	40·6	34·6
Gum	6·3	5·9
Woody fibre	44·8	51·3
Glutinous matter	6·3	5·7
Volatile matter, and loss	2·0	2·5
Tea	100·0	100·0

Sir H. Davy (*Phil. Trans.* 1803, p. 268) also found more tannin in black than in green tea, in the proportion of 48 to 41. But these results are opposed to our daily experience, as derived from flavour, which indicates the greater astringency in the green tea, and to the experiments of Mr. Brande (*Quart. Journ.* xii. 201). The difference in the quantity of tannin in the two kinds of tea, is, however, not very great. A few years ago, Oudry (Thomson, *Org. Chem.* p. 295) announced the existence in tea of a crystalline, salifiable base, to which he gave the name of *theina*; but more recently, Jobst (*Ann. d. Pharm.* xxv. 63, 1838) has asserted its identity with *caffein*, already noticed (p. 1031). Notwithstanding the extensive employment of tea as an article of diet, yet it is no easy matter to ascertain correctly its precise *effects* on the constitution. Its astringency is proved by its chemical properties; and hence tea may be resorted to as an easily accessible antidote in cases of poisoning by substances containing vegetable alkalies (see p. 70), or by emetic tartar. Another quality possessed, especially by green tea, is that of diminishing the tendency to sleep. Hence, like coffee (see p. 1031) tea is often resorted to by those who desire nocturnal study. Moreover, it may be employed as an antisoporific to counteract the effects of opium and intoxicating liquors; and Dr. Clutterbuck (*Inq. into the Seat and Nat. of Fever*, 2nd ed. p. 434) has suggested its application to the relief of the stupor of fever, which he considers to be nearly allied to intoxication. Tea appears to possess a sedative influence with regard to the vascular system; and in this, as well as in the watchfulness which it produces, tea somewhat resembles foxglove. On account of its sedative power, Dr. T. Percival (*Essays*, vol. i.) recommends its use in feverish and inflammatory diseases, and I can speak from frequent observation of its good effects in these maladies. To this power should also be referred the relief of headache experienced by the use of tea. In colds, catarrhs, rheumatism, &c. warm infusion of tea is frequently employed as a diluent, diaphoretic, and diuretic. Strong green tea taken in large quantities is capable, in some constitutions, of producing most distressing feelings (Dr. E. Percival, *Dubl. Hosp. Rep.* vol. i. p. 219); and of operating as a narcotic. Dr. Lettsom (*Nat. Hist. of the Tea Tree*, 1772) found that a strong infusion of tea introduced into the abdomen of a frog caused paralysis of the hind extremities of the animal. (For some interesting information on Tea, see Dr. Sigmond's work, entitled *Tea, its Effects, Medicinal and Moral.* 1839).

ORDER 69. DIPTERA'CEÆ, *Lindley*.—THE DIPTEROCARPUS TRIBE.

DIPTEROCARPEÆ, *Blume*.

Dryobalanops aromatica, Gærtner (*D. Camphora*, Colebrooke; *Shorea camphorifera*, Roxb.) is a large tree growing in Sumatra and Borneo. From its stem are obtained a liquid called *Camphor oil*, and a crystalline solid denominated *Sumatra* or *Borneo Camphor*

1. *Camphor Oil*.—Is obtained by making deep incisions into the tree with an axe. The oil gushes out, and is received in bamboos or other convenient utensils (Prince, Roxb. *Fl. Ind.* ii. 616). It is occasionally imported into this country in tin canisters. It is sometimes perfectly limpid, transparent, and colourless. But more usually it is more or less coloured, being yellowish or brownish. Its odour is somewhat analogous to that of oil of cajuputi, combined with the odour of camphor and cardamoms. Some samples have a strong odour of turpentine. This oil has been analyzed by Martius (*Berlin. Jahrbuch*, Bd. xl. S. 464, 1838). The mean of three analyses gave him for its constituents *carbon* 83·129, *hydrogen* 11·346, and *oxygen* 5·525: or $C^{20}\ H^{16}\ O^{8}$. Camphor oil has been employed in the preparation of scented soap. Sixty pounds of dark brown oil yielded a distiller forty pounds of colourless liquid oil, and twenty pounds of crystalline camphor.

2. *Sumatra* or *Borneo Camphor*. By the natives of Sumatra it is termed *Kapūr-Barus* (i.e. *Baroos Camphor*).—It is found in the natural fissures or crevices of the wood, and is obtained by cutting down the tree, dividing it transversely into several

blocks, which are split with wedges into small pieces, from the interstices of which the camphor, if there be any, is extracted (Marsden, *Hist. of Sumatra*, p. 150, 3rd ed.) After being separated from impurities, it is packed in *catties*. Being much esteemed by the Chinese, it fetches a very high price. According to Mr. Crawford (*Hist. of the Ind. Archip.* vol. iii. p. 418) its value is 78 times that of Japan camphor! It rarely comes to this country as a commercial article. For some of the samples in my museum I am indebted to Mr. Gibson (of the firm of Howard, Jewell, and Gibson, of Stratford), who says, "they are part of two very small boxes imported about twenty years ago, which were bought by me at the common price of camphor at the time, but which, it was afterwards discovered, were invoiced at an enormous price. Our firm gave them up to the importers, reserving samples, and they were re-shipped for India. I never, on any other occasion, except one, saw a small specimen of what I have named *native camphor.*"

Sumatra camphor occurs in small crystals, which are readily distinguished from those of ordinary camphor (see p. 790). Thus they are heavier than water, give a ringing sound when shaken in a bottle, and do not so readily sublime and condense in crystals in the upper part of the bottle.

As a medicinal agent it is highly esteemed in the East. It is probable, however, that it is not superior in this respect to ordinary camphor, notwithstanding the much greater price paid for it by the Chinese.

Order 70. Byttneria′ceæ, *Decandolle*.—The Cacao Tribe.

Fig. 232.

Theobroma Cacao.

The *Theobroma Cacao* is a native of the West Indies and of Continental America. Its seeds (*nuclei cacao*) when torrefied, and with various additions (sugar, and usually either cinnamon or vanilla), made into a paste, constitutes *chocolate* (*chocolata*), which furnishes a very nourishing beverage, devoid of the ill properties possessed by both tea and coffee, but which, on account of the contained oil, is apt to disagree with dyspeptics. (For particulars respecting the manufacture of chocolate see Ure, *Dict. of Arts*, 292; and Soubeiran, *Traité de Pharm.* i. 447). *Cocoa* is another preparation of these seeds. It is said to be made from the fragments of the seed-coats mixed with portions of the kernels. It is somewhat astringent, and is adapted for persons with relaxed bowels.

Order 71. Malva′ceæ, *R. Brown*.—The Mallow Tribe.

Essential Character.—*Calyx* of five (rarely three or four) sepals, more or less coherent at the base, valvate in æstivation, often with bracts or external sepals forming an involucre or outer calyx. *Petals* as many as the sepals, and alternate with them; hypogynous, equal; spirally contorted in æstivation, generally adnate to (but sometimes distinct from) the lower part of the tube of the stamens. *Stamens* equal in number, or more commonly a multiple of the petals; generally indefinite (rarely definite), hypogynous. *Filaments* united into a tube, and unequal in length, the outer ones being shorter. *Anthers* one-celled, uniform, dehiscing by a transverse chink. *Ovary* of many carpels, generally verticillated round the axis, and coherent (sometimes free). *Styles* as many as the carpels, either distinct or united. *Stigmas* as many as the carpels, more or less distinct. *Carpels* either one- or two-seeded, and dehiscing inward by a chink, or polyspermous, with a loculicidal dehiscence, or having a septum in the middle which bears the seeds on the inner side; in some cases nearly free, in others united into a many-celled capsule or an anomalous berry. *Albumen* none. *Embryo* straight. *Radicle* terete. *Cotyledons* twisted like a chrysalis.—*Herbs*, *shrubs*, or *trees*. *Leaves* alternate, generally petiolate, and with stipules (D. C.)

Properties.—"The uniform character is to abound in mucilage, and to be totally destitute of all unwholesome qualities" (Lindley).

Mal'va sylves'tris, Linn. L. E.—*Common Mallow.*

Sex. Syst. Monadelphia, Polyandria.

(Herb, *E.*)

History.—According to Dr. Sibthorp (*Prodr. Fl. Græc.* ii. 45), the Μαλάχη χερσαία of Dioscorides (lib. ii. cap. 144) is the *Malva sylvestris.*

Botany. *Gen. Char.*—*Calyx* five-cleft, persistent, surrounded by an involucel of usually three, rarely one or two, or five or six, more or less oblong or setaceous bracteoles. *Ovary* with many cells, each with one ovule. *Styles* as many as the cells. *Carpels* several (rarely only five), capsular, indehiscent, one-seeded, circularly arranged around the axis. *Radicle* inferior (*Wight* and *Arnott*).

Sp. Char.—*Stem* erect. *Leaves* five- to seven-lobed, acute. *Pedicels* and *petioles* hairy (D. C.)

Root perennial, tapering, branching, whitish. *Stem* two or three feet or more high, branched. *Leaves* deep green, soft and downy. *Flowers* large, three or four together, axillary. *Petals* obcordate, purplish-rose coloured, with deeper veins, combined by the base of their claws.

Hab.—Indigenous; hedges and road sides. Flowers from June to August.

Description.—Common Mallow (*herba malvæ sylvestris*) is odourless, and has merely a mucilaginous herbaceous taste. Its watery infusion is deepened in colour by the sesquichloride of iron, and forms a precipitate with acetate of lead. Dwarf mallow (*herba malvæ rotundifoliæ*) possesses similar properties.

Composition.—I am unacquainted with any analysis of this plant. The constituents are probably similar to those of Althæa officinalis (p. 1250). *Mucilage* is the prevailing principle. *Extractive* also is another constituent. The *colouring matter* of the flower is an exceedingly delicate test of the alkalies, which render it green.

Physiological Effects and Uses.—Emollient and demulcent. Employed in the form of decoction, in irritation of the alimentary canal and of the pulmonary and urinary organs. In tenesmus the decoction is used in the form of enema. In external inflammations, emollient fomentations and cataplasms of mallow are sometimes employed.

Decoctum Malvæ compositum, L. (Mallow, dried, ℥j.; Chamomiles, dried, ℥ss.; Water, Oj. Boil for a quarter of an hour, and strain).—Employed for fomentations and enemata as above mentioned.

Althæ'a officina'lis, Linn. L. E. D.—*Common Marsh-mallow.*

Sex. Syst. Monadelphia, Polyandria.

(Folia. Radix, *L. D.*—Leaves. Root, *E.*)

History.—According to Dr. Sibthorp (*Prodr. Fl. Græc.* ii. 42) this plant is the Ἀλθαία of Dioscorides (lib. iii. cap. 163).

Botany. *Gen. Char.*—*Calyx* surrounded by a six- to nine-cleft involucel. *Carpels* numerous, capsular, closely and circularly arranged round the axis (*Wight* and *Arnott*).

Sp. Char.—*Leaves* softly tomentose on both sides, cordate or ovate, toothed, undivided or somewhat three-lobed. *Peduncles* axillary, many-flowered, much shorter than the leaf (*D. C.*)

Root perennial, tap-shaped, rather woody. *Stem* two or three feet high. *Leaves* hoary green, peculiarly soft and downy, with a fine starry pubescence. *Flowers* three or four together, on axillary stalks, large, pale rose coloured.

Hab.—Indigenous; marshes, especially near the sea.

Description.—The leaves of Marsh-mallow (*folia althææ*) are odourless, and have a mucilaginous taste. The root (*radix althææ*) is long, cylindrical, branched, about the thickness of the finger, plump, mucilaginous, white internally, and covered with a yellowish epidermis. That which is imported from France has been deprived of its epidermis, and is white (*decorticated root of marshmallow*). Its odour is feeble, its taste sweet and mucilaginous. Iodine colours it dark blue. Sesquichloride of iron forms with the concentrated decoction a brown semi-transparent gelatinous mass.

Composition.—Marsh-mallow root has been analyzed by Bacon (*Journ. de Chim. Méd.* ii. 551); by L. Meyer (Gmelin, *Handb. d. Chem.* ii. 1251); by Wittstock (*Pharm. Central-Blatt für* 1831, S. 277), and by Buchner (*Ibid. für* 1832, S. 511). The results of the latter chemist are as follows:—*Fatty oil* 1·26, *glutinous matter* 1·81, *uncrystallizable sugar* and *althein* 8·29, *mucilage* 35·64, *starch* 37·51, *phosphate of lime* 8·29, *vegetable medulla* 11·05, and *woody fibre* 7·50 [excess 11·35].

Asparagin; Asparamide; Althein.—The substance which has been called *althein* is identical with *asparagin*. It is crystallizable, odourless, and almost tasteless. It is soluble in water, and in alcohol, sp. gr. 0·837; but it is insoluble in absolute alcohol and in ether. It consists of $C^8 H^7 N^2 O^5$. Acted on by the watery solutions of the alkalies, it evolves ammonia, and is converted into *aspartic acid* ($C^8 H^5 N O^6$): hence it is called *asparamide*, as it is an aspartate of ammonia ($C^8 H^5 N O^6 + H^3 N$), minus an atom of water. It has no influence on the therapeutic properties of the root.

Physiological Effects and Uses.—Similar to those of common mallow, already stated (p. 1249). On the continent it is a favourite demulcent. The *pastilles* and *pate de guimauve* are used as pectorals. The powder of marsh-mallow root is used in France to envelope pills. "The simple decoction is recommended as an injection, to be thrown into the vagina, in cases of difficult labour, arising from rigidity of the soft parts" (Montgomery, *Obs. on the Dub. Pharm.*)

1. *Mistura Althææ*, E. *Decoctum Althææ*, D. (Root [and herb, *D.*] of Althæa, ℥iv.; Raisins stoned, ℥ij.; [Boiling, *E.*] Water Ov. [Ovij. wine measure, *D.*] Boil down to three [five, *D.*] pints; strain [through linen or calico, *E.*], and when the sediment has subsided, pour off the clear liquor for use).—An agreeable diluent and demulcent. Employed in visceral inflammation and irritation; as nephritis, calculous affections, gonorrhœa, strangury, &c. From one to three pints may be taken in the course of the day.

2. *Syrupus Althææ*, L. E. D. (Althæa root, fresh and sliced, ℥viij. [lb. ss., *D.*]; Pure Sugar, lb. ijss. [lb. ij. *D.*]; Water [boiling, *E.*], Oiv. Boil down the water with the root to one half [strain, *E.*], and express [strongly through calico, *E.*] the liquor [when cold, *L. D.*] Set aside for twenty-four hours, that the impurities may subside; then pour off the liquor, and the sugar being added, boil down to a proper consistence).—Demulcent. Employed as an adjunct to cough mixtures, and as a pectoral for children. It readily ferments, and becomes ropy. Dose, f℥j. to f℥ss.

Gossyp'ium herba'ceum, Linn. E.—*Common Cotton.*

Sex. Syst. Monadelphia, Polyandria.

(Hairs attached to the seed, *E.*)

History.—It is somewhat doubtful who first mentioned cotton. There is some reason for supposing that cotton cloth is referred to in the Old Testament (Harris, *Nat. Hist. of the Bible;* Carpenter, *Script. Nat. Hist.*) Cotton is certainly mentioned by Herodotus (*Thalia*, cv.); but he or his translators are in error, in stating (*Euterpe*, lxxxvi.) that the Egyptians, in embalming, wrapped the body in cotton cloth; since all mummy cloths are found, on a microscopic examination, to be linen. Pliny (*Hist. Nat.* lib. xix. cap. 2, ed. Valp.) speaks of the cotton plant (*Gossypion*), and of the cloth (*Xylina*) made of the woolly substance which envelopes the seeds.—(For further details see Royle's *Illustr*. p. 84, *et seq.*)

Botany. *Gen. Char.*— *Calyx* cup-shaped, obtusely five-toothed, surrounded by a three-leaved involucel, with the leaves united and cordate at the base, and deeply cut or toothed irregularly. *Style* simple, marked with three or five furrows towards the apex. *Stigmas* usually three, sometimes five. *Capsules* three- to five-celled, three- to five-valved at the apex, loculicidal. *Seeds* numerous, imbedded in cotton.—Young *branches* and *leaves* more or less conspicuously covered with little black dots; nerves below usually with one or more glands (*Wight and Arnott*).

Fig. 233.

Gossypium herbaceum.

Sp. Char. — Bi-triennial; *young parts* hairy. *Leaves* hoary, palmate, with sub-lanceolate, rather acute lobes. *Stipules* falcate-lanceolate. *Leaves* of the exterior calyx dentate. *Capsules* ovate pointed. *Seeds* free, clothed with firmly adhering white down under the long white wool (*Roxburgh*). — *Petals* of a lively yellow colour, with a purple spot near the claw. Dr. Roxburgh (*Fl. Ind.* iii. 184) particularly distinguishes three varieties cultivated in India—viz. the *Dacca*, the *Berar*, and the *China* cottons.

Hab.—Asia. Cultivated in India, Syria, Asia Minor, the Mediterranean, and America.

Description. — The filamentous substance, called *cotton* (*gossypium*), consists of tubular hairs, which arise from the surface of the seed-coat. By drying, they become flattened; and in this state, if they be immersed in water and examined by the microscope, they appear like distinct, flat, narrow ribands, with only occasional appearances of joints, which are indicated by a line at a right angle, or nearly so, to the side of the tube. Cotton is distinguished (under the microscope) from the vegetable fibre which constitutes linen by the tubes of the latter being in bundles, round, tapering at the extremities, and, when jointed, having oblique articulations. Cotton which has undergone no preparation is denominated *raw cotton.* — (For much interesting information regarding Cotton, but which is unsuited to this work, consult Royle, *op. cit.*; M'Culloch's *Dict. of Comm.*; and Ure's *Dict. of Arts.*)

COMPOSITION.—Cotton is a modification of *lignin*, and consists, therefore, of *carbon*, *hydrogen*, and *oxygen;* but the precise relative proportions of its constituents have not been ascertained. In all its essential chemical properties it agrees with ordinary woody fibre. It is completely insoluble in water, alcohol, ether, oils, and vegetable acids. Strong alkaline leys dissolve it. The strong mineral acids decompose it. With nitric acid it yields oxalic acid.

PHYSIOLOGICAL EFFECTS AND USES.—Raw cotton, or cotton-wool, has been employed with apparently good effect in the treatment of burns (Anderson, *Ed. Med. and Surg. Journ.* vol. xiii. p. 215, 1828). It allays pain and irritation, apparently by forming, with the discharges, a substitute for the epidermis, under the protection of which the process for the formation of the new cuticle takes place, undisturbed by external irritation. The exclusion of the air seems to be a most important part of the treatment; and, of course, to effect this, many other agents (as lint) will answer in the place of cotton. The following is the method of employing cotton:—The cotton should be carded in narrow fleeces, thin enough to be translucent, and applied in successive layers, so as completely to protect the injured parts from the effects of motion and pressure. When the skin is severely scorched, a spirituous or turpentine wash may be applied previously to the application of the cotton. As complete repose of the part is necessary, the first dressing should be allowed to remain as long as possible undisturbed.

Cotton-wool impregnated with nitre or chlorate of potash has been employed as moxa (see p. 957).

The well-known superiority of linen to cotton, as a dressing for wounds and ulcers, is usually ascribed to the triangular shape of the cotton fibres, the sharp angles of which are supposed to cut and irritate the flesh. But this shape of the fibres exists only in the imagination of those who have never examined them by the microscope. Raspail (*Chim. Organ.*) ascribes the superiority of linen for surgical purposes to the hollow condition of the tubular fibrillæ, by which they are enabled to absorb into their interior the blood or purulent secretion. The tubes of cotton, on the other hand, are filled with an organizing substance, and, therefore, can imbibe nothing into their interior.

ORDER 72. LINA'CEÆ, *Lindley*.—THE FLAX TRIBE.

LINEÆ, *Decandolle*.

ESSENTIAL CHARACTER.—*Calyx* three- or four-, generally five-sepaled. *Sepals* coherent only at the base, imbricate in æstivation, continuous with the peduncle, and therefore persistent. *Petals* as many as the sepals; hypogynous, unguiculate at the base, slightly united together, and to the ring of the stamens; alternate with the sepals, twisted in æstivation. *Stamens* equal in number, and alternate with the petals, cohering into a monadelphous ring at the base, and having an abortive filament, or tooth, between each. *Anthers* innate, bilocular, bi-rimose. *Ovaries* subglobose, with as many cells as there are sepals, rarely fewer. *Styles* as numerous as the cells of the ovary. *Capsule* globose, crowned by the permanent bases of the styles, composed of carpels having induplicate margins and dehiscing at the apex by two valves, and which are divided into two partial cells, by an incomplete dissepiment arising from the centre. Seeds in each cell, two inverted. *Albumen* generally none, but in its stead there is a tumid fleshy endopleura. *Embryo* straight, with the radicle turned towards the hilum.—*Herbs* or *shrubs* with entire exstipulate *leaves* (D.C.)

PROPERTIES.—The fibres of Linaceæ have great tenacity. The seeds abound in oil and mucilage, and are in consequence emollient.

Li'num usitatis'simum, Linn. L. E. D.—*Common Flax.*

Sex. Syst. Pentandria, Pentagynia.

(Semina. Oleum e seminibus expressum. *L. D.*—Seeds. Meal of the Seeds deprived of their fixed oil by expression. Expressed oil of the seeds, *E.*)

History.—From time immemorial flax has been employed in the manufacture of cloth; and it appears from our most ancient records that Egypt was celebrated for its production (*Exod.* ix. 31.; Herodotus, *Euterpe*, cv.)

Botany.—*Sepals* five, distinct, quite entire or serrated. *Petals* five. *Stamens* five. *Styles* three to five, distinct from the base, or combined to the middle or apex (*Wight* and *Arnott.*)

Fig. 234.

Linum usitatissimum.

Sp. Char.—Smooth, erect. *Leaves* lanceolate or linear. *Panicle* corymbose. *Sepals* ovate, acute, with membranous margins. *Petals* somewhat crenate, larger by three times than the calyx (*D. C.*)—Annual. One or two feet high. *Leaves* distant. *Flowers* large, purplish-blue. *Capsule* globular, about the size of a small pea.

Hab.—Indigenous; corn fields; not unfrequent. Extensively cultivated in this, as well as in other European countries, both for its fibre for making thread, and for its oil obtained from the seeds.

Description.—The seed of the flax, commonly termed *linseed* or *lintseed* (*semina lini*) is small (about a line long), oval, oblong, flattened on the sides with acute edges, pointed at one extremity, smooth, glossy, brown externally, yellowish-white internally, odourless, and has an oily mucilaginous taste. The seed coat is mucilaginous;—the nucleus oily. The *cake* (*placenta lini*) left after the expression of the oil, is usually denominated *oil cake*; it forms, when ground to a fine powder, *linseed meal* (*farina lini*). Its colour is grayish-brown. It abounds in mucilage. The meal prepared by grinding the unpressed seeds yields a considerable quantity of oil.

The substance termed *flax* is prepared from the fibrous portions of the bark of the plant (See Ure's *Dict. of Arts*, p. 482). The short fibres which are removed in heckling constitute *tow* (*stupa*), which is employed both in pharmacy and surgery. Of flax is made *linen* (*linteum*), which when scraped constitutes *lint* (*linteum carptum; linamentum*) an important agent to the surgeon.

Composition.—Linseed has been analyzed by L. Meyer (Gmelin, *Handb. d. Chem.* ii. 1251). Its constituents he found to be as follows:—*fat oil* (in the nucleus) 11·265, *wax* (in the husk principally) 0·146, *acrid soft resin* (in the husk principally) 2·488, *resinous colouring matter* 0·550, *yellow extractive with tannin* and *salts* (nitre and the chlorides of potassium and calcium) 1·917, *sweet extractive* with *malic acid* and some *salts* 10·884, *gum* (in the nucleus) 6·154, *nitrogenous mucilage* with *acetic acid* and *salts* (in the husk principally) 15·120, *starch* with *salts* (in the husk) 1·480, *albumen* (in the nucleus) 2·782, *gluten* (in the nucleus) 2·932, *husk* with *emulsin* (?) 44·382. The ashes contained *oxide of copper.*

1. *Fixed Oil* (*Oleum Lini*).—To prepare this oil the seeds are first bruised or crushed, then ground, and afterwards subjected to pressure in the hydraulic press. (See Ure's *Dict. of Arts*, p. 899). *Cold-drawn linseed oil* (*oleum lini sine igne*) is paler coloured, less odorous, and has less taste than linseed oil prepared by the aid of a steam heat of about 200° F. (*oleum lini*, offic.); but, according to Mr. Brande (*Dict. of Pharm.*) it "soon becomes rancid and more disagreeable than that expressed at a higher temperature." The seeds yield by cold expression 18 or 20 per cent. of oil; but by the aid of heat from 22 to 27 per cent. Linseed oil is usually amber-coloured; but it may be rendered quite colourless. For a fine sample of colourless oil I am indebted to Mr. Whipple. Linseed oil has a peculiar odour and taste; it is soluble in alcohol, but more readily so in ether. When exposed to the air it dries into a hard, transparent varnish. This change is greatly accelerated by boiling the oil either alone or with litharge, sugar of lead or common white vitriol. The resulting oil is called *drying oil* or *boiled oil.* The efficacy of the process is ascribed by Liebig (*Journ. de Pharm.* xxvi. 193) to the elimination of substances which oppose the oxidation of the oil. The ultimate composition of linseed oil, according to Saussure, is *carbon* 76·014, *hydrogen* 11·351, and *oxygen* 12·635. Its proximate constituents are *oleic acid* (chiefly), *margaric acid*, and *glycerin.*

2. *Mucilage of linseed.*—Has been examined by Bostock (*Nicholson's Journ.* xviij. 31), by Vauquelin (*Ann. de Chim.* lxxx. 314), and by Guerin-Varry (*Journ. de Chim. Méd.* vii. 739). Resides in the seed-coats. Is extracted by hot water. When the solution is mixed with alcohol, white mucilaginous flocks are precipitated. Diacetate of lead forms a precipitate in it. Neither infusion of nutgalls nor chlorine have any effect on it. It is not coloured blue by iodine. It reddens litmus (owing to the free acetic acid). It consists of two parts: one soluble, the other insoluble in water. Its ashes contain carbonates of potash and lime, phosphate of lime, chloride of potassium, sulphate of potash, oxide of iron, alumina, and silica.

Proximate Analysis.		*Ultimate Analysis.*	
Soluble part	52·70	Carbon	34·30
Insoluble part	29·89	Hydrogen	5·69
Ashes	7·11	Nitrogen	7·27
Water	10·30	Oxygen	52·74
Mucilage of Linseed	100·00	Mucilage of Linseed	10·000

α. *Soluble part* (*Arabine?*) soluble in cold water. Treated with nitric acid yields 14·25 per cent. of mucic acid, besides some oxalic acid.

β. *Insoluble part.* A nitrogenous substance, not soluble in water, and not yielding mucic acid by the action of nitric acid. Properly speaking, therefore, it is not a gummy substance.

Physiological Effects.—Linseed is emollient and demulcent. It also possesses nutritive qualities; for, in the form of a thick mucilage (or jelly, as it is termed), it is employed for fattening cattle: *Linseed cake* is also employed for a similar purpose. *Linseed oil* is a mild laxative.

Uses.—Employed, to allay irritation, in the form of *infusion* or *tea*, *expressed oil*, and *meal.*

1. *Infusum Lini compositum*, L. D. *Infusum Lini, E. Linseed Tea.*—(Linseed, bruised, ʒvj. [℥j. *D.*]; Liquorice-root, bruised, ʒij. [℥ss. *D*]; Boiling [distilled, *L.*] Water, Oj. [Oij. *D.*] Digest [near the fire, *L. E.*] in a lightly-covered vessel, and strain [through linen or calico, *E.*]) Employed as an emollient and demulcent in irritation and inflammation of the pulmonary and urinary organs, and of the mucous membranes generally: as gonorrhœa, dysentery, alvine irritation, and pulmonary affections. It is rendered more palatable by the addition of sliced lemon and sugar-candy. Dose, f℥ij. to f℥iv. or *ad libitum.*

2. *Oleum Lini*, L. E. D.—(The preparation and properties of this oil have been already described). Rarely employed internally. Its most ordinary use is for the preparation of *linimentum calcis*, already (p. 346) described.

3. *Farina Lini*, E. *Linseed Meal.*—(The meal of the seeds deprived of their fixed oil by expression, *E.*) Emollient. Employed in the preparation of the *linseed-meal poultice.* It is a constituent of the *pulvis pro cataplasmate*, D. already (p. 590) noticed.—The farina of the unpressed linseed is to be preferred to the powder of linseed-cake, on account of its oleaginous quality.

4. *Cataplasma Lini*, L.—(Boiling Water, Oj.; Linseed, powdered, as much as may be sufficient to make it of a proper consistence. Mix). A valuable emollient poultice.

Li'num cathar'ticum, Linn. E.—*Purging Flax.*

Sex. Syst. Pentandria, Pentagynia.

(Herb, *E.*)

History. — First mentioned by Thalius in the sixteenth century (Sprengel, *Hist. Rei Herb.* i. 35).

Botany. *Gen. Char.*—See Linum usitatissimum.

Sp. Char.—Smooth, erect. *Leaves* opposite, obovate-lanceolate. *Stem* above dichotomous (*D. C.*)

Annual. Stem slender, two to six inches high. *Flowers* drooping before expansion, white, small.

Hab.—Indigenous; pastures; common.

Description.—Purging flax (*herba lini cathartici*) is odourless, but has a very bitter taste.

Composition.—I am unacquainted with any analysis of this plant. Probably its purgative principle is *bitter extractive.*

Physiological Effects and Uses.—Cathartic and occasionally diuretic; but somewhat uncertain in its operation. Formerly used in rheumatism. Now almost obsolete. Dose, ʒj. of the dried plant; or an infusion of a handful of the fresh plant may be employed.

Order 73. Caryophylla'ceæ.—The Chickweed Tribe.

Caryophylleæ, *Jussieu; Decandolle.*

Essential Character.—*Calyx* generally persistent, of four or oftener five sepals, which are continuous with the pedicel, and either free or coherent into a four- or five-dentate tube, imbricate in æstivation. *Petals* as many as the sepals (very rarely none), inserted on the torus, which is more or less elevated on a pedicel (anthophorus), alternate with the sepals, unguiculate, having the fauces sometimes crowned with petaloid scales. *Stamens* as many as, or double the number of, the petals, inserted in the torus. *Filaments* subulate, sometimes submonadelphous at the base. *Anthers* two-celled. *Ovary* simple, two- to five-valved, inserted at the apex of the torus, and crowned by an equal number of styles. *Capsule* of two to five valves, united at the base, dehiscing at the apex, generally one-celled, sometimes two- to five-celled. *Septa* protruding from the middle of the valves, incomplete or continuous to the axis. *Placenta* central. *Seeds* numerous (very seldom few or definite); *albumen* farinaceous, generally central; *embryo* usually peripherical, more or less incurved (seldom central and straight); *radicle* directed towards the hilum.—*Herbs* or *under-shrubs*, with opposite entire *leaves*. *Stems* jointed (D. C.)

Properties.—Remarkable, for the most part, for their insipidity and consequent inactivity.

Dian'thus Caryophyl'lus, Linn. D.—*Clove Pink; Carnation*, or *Clove Gillyflower*.

Sex. Syst. Decandria, Digynia.

(Flores, *D.*)

History.—First noticed by Manfredus de Monte Imperiali (Sprengel, *Hist. Rei Herb.* i. 298).

Botany. *Gen. Char.*—*Calyx* tubular, five-toothed, imbricated at the base with two to four opposite scales. *Petals* five, with long claws. *Stamens* ten. *Styles* two. *Capsule* one-celled. *Seeds* compressed, convex on one side, concave on the other; peltate. *Embryo* scarcely curved (D. C.)

Sp. Char.—*Stem* branched. *Flowers* solitary. *Scales* of the calyx four, very short, ovate, somewhat mucronate. *Petals* very broad, beardless. *Leaves* linear-awl-shaped, channelled, glaucous (D. C.)

A *perennial* plant; the origin of the fine carnations of the gardens. *Flowers* pink, purple, white, or variegated; double, semi-double, or single.—(For horticultural information respecting them, consult Loudon's *Encycl. of Gard.*)

Hab.—Indigenous. Cultivated in gardens.

Description.—The red or deep crimson gilliflowers (*flores dianthi caryophylli; flores caryophylli rubri; flores tunicæ*) were formerly employed in medicine on account of their colour. They have a pleasant aromatic smell, and a bitterish sub-astringent taste. They communicate to water their smell and colour (Lewis, *Mat. Med.*)

Composition.—I am unacquainted with any analysis of them. They obviously contain *a volatile oil, colouring matter*, and an *astringent principle*.

Physiological Effects and Uses.—Formerly supposed to have an influence over the nervous system, to raise the spirits, &c. Simon Pauli (*Quadrip. Bot.* p. 241) recommended them in various nervous and spasmodic affections, and in malignant fever. They have also been used as flavouring and colouring agents; and a *syrup* of them was formerly contained in the British pharmacopœias. Though still retained in the Dublin pharmacopœia, their medical use is obsolete.

Order 74. Polyg'aleæ, *Decandolle*.—The Milkwort Tribe.

Polygalaceæ and Krameriaceæ, *Lindley*.

Essential Character.—*Sepals* five, imbricate in æstivation, the two interior generally petaliform, the three exterior smaller; two of them are interior and sometimes united, the third is posterior. *Petals* three to five, hypogynous, more or less united by means of the tube of the stamens (rarely distinct). *Filaments* of stamens adherent to the petals, monadelphous, divided at the apex into two opposite equal phalanxes. *Anthers* eight, one-celled, innate, dehiscing by pores at the apex. *Ovary* one, free, two-celled, rarely one- or three-celled. *Style* one. *Stigma* one. *Pericarp* capsular or drupaceous, two- or one-celled. *Valves* septigerous in the middle. *Seeds* pendulous, solitary, often with a carunculate arillus at the base; *embryo* straight, generally in the axis of a fleshy albumen, (or rarely) exalbuminous, in which case the endopleura is tumid.—*Herbs* or *shrubs*. *Leaves* entire, generally alternate, articulated on the stem (*D. C.*)

Properties.—Leaves and roots for the most part bitter and astringent.

Polyg'ala Sen'ega, Linn. L. E. D.—*The Seneka.*

Sex. Syst. Diadelphia, Octandria.

(Radix, *L. D.*—Root, *E.*)

History.—The root of this plant was introduced into medicine as a remedy for the bites of venomous animals, in the early part of the last century, by Dr. Tennant, a Scotch physician, residing in Pennsylvania (*An Epistle to Dr. Mead.* 1742).

Botany. *Gen. Char.*—*Sepals* persistent, the two inner ones winglike. *Petals* three to five, adnate to the tube of the stamen; the inferior one keel-shaped (perhaps composed of two united). *Capsule* compressed, elliptical, or obcordate. *Seeds* pubescent, carunculated at the hilum, destitute of a coma (D. C.)

Sp. Char.—*Stems* several, somewhat erect, simple, terete. *Leaves* ovate-lanceolate, the upper ones acuminate. *Racemes* somewhat spiked. *Wings* orbiculate. *Capsule* elliptical, emarginate (D. C.)

Root perennial, branching. *Stems* annual, from nine to twelve inches high, occasionally tinged at their lower part with red or purple. *Leaves* alternate, sessile, or on very short stalks, paler beneath. *Flowers* small, white. *Alæ* of the calyx white, with green veins. *Capsule* small, containing two blackish *seeds.*

Hab.—United States of America: most abundant in the southern and western parts.

Description.—*Senega* or *Seneka* root (*radix senegæ* seu *senecæ*), sometimes called the *seneka-snakeroot* or the *rattlesnake root*, is imported from the United States in bales. It varies in size from that of a writing quill to that of the little finger; it is contorted, presents a number of eminences, and terminates superiorly in an irregular tuberosity, which exhibits traces of numerous stems: a projecting line extends the whole length of the root. The cortical portion is corrugated, transversely cracked, thick, of a greyish yellow colour. The central portion (*meditullium*) is woody and white. The taste of the root is at first sweetish and mucilaginous, afterwards acrid and pungent, exciting cough and a flow of saliva: its odour is peculiar and nauseous.

Composition.—Senega root has been repeatedly made the subject of chemical investigation. In the last century it was examined by Burckhard, by Keilhorn, and by Helmuth (Murray, *App. Med.* ii. 564). In 1804 it was analyzed by Gehlen (Gmelin, *Handb. d. Chem.* ii. 1249); and in 1811 by Fougeron (*Journ. de Chim. Méd.* ii. 549). Peschier (quoted by Goebel and Kunze, *Pharm Waarenk.*) also published an analysis of it. In 1826, Feneulle (*Journ. de Chim. Méd.* ii. 431), in 1827 both by Dulong d'Astafort (*Journ. de Pharm.* xiii. 567) and by Folchi (*Journ. de Chim. Méd.* iii. 600), in 1832 by Trommsdorf (*Pharm. Central-Blatt* für 1832, S. 449), and in 1836 by Quevénne (*Journ. de Pharm.* xxii.) I subjoin three of these:—

Trommsdorf.		*Dulong.*	*Quevénne.*
Volatile oil	*a trace.*	Volatile oil, traces.	Polygalic acid.
Acrid resin	4·552	Acrid extractive.	Virgineic acid.
Sweetish-bitter extractive	33·570	Yellow extractive.	Tannic acid.
Pectic acid	10·444	A substance reddened by sulphuric acid.	Pectic acid.
Wax	0·746	Pectic acid.	Cerin.
Soft resin	5·222	Wax.	Fixed oil.
Mucus	5·968	Resin.	Yellow colouring-matter.
Woody fibre	34·316	Gum.	Gum.
Malates, potash, and lime	2·536	Woody fibre.	Albumen.
		Malates of potash and lime.	Woody fibre.
		Mineral salts and iron.	Salts, alumina, silica, magnesia, and iron.
Dried Senega root	97·354	Senega root.	Senega root.

1. *Polygalic Acid,* in the impure state, was first procured by Gehlen, who called it *Senegin.* It is the active principle of the root, and resides in the cortical part of the root. When pure it is a white odourless powder, which is at first tasteless, but afterwards communicates an acrid feeling to the mouth, and a sense of constriction to the fauces. It irritates the nostrils, and excites sneezing. It is volatile, and, when decomposed by heat in a glass tube, evolves no ammonia, and hence contains no nitrogen. It is soluble in water and in alcohol, especially when aided by heat; but is insoluble in ether, acetic acid, and the oils. Its solution forms white precipitates (*polygalates*) with diacetate of lead and protonitrate of mercury. Sulphuric acid has a characteristic effect on polygalic acid: it renders polygalic acid yellow, then rose-red, and afterwards dissolves it, forming a violet-coloured solution, which becomes decolorized in twenty-four hours. The *alkaline polygalates* are not crystallizable. Polygalic acid consists of *carbon* 55·704, *hydrogen* 7·529, and *oxygen* 36·767; or $C^{22} H^{18} O^{11}$. It has considerable resemblance to esculic acid (*Journ. de Pharm.* xxiii. 270). Given to dogs, in doses of six or eight grains, it causes vomiting, embarrassed respiration, and death in three hours. Two grains thrown into the jugular vein caused vomiting, and, in two hours and a half, death.

2. *Virgineic Acid.*—A volatile fatty acid, analogous to valerianic, phocenic, and butyric acids. It is an oily liquid, of a reddish colour, a strong, penetrating, disagreeable odour, and an acrid taste. It is soluble in alcohol, ether, and caustic potash, but scarcely so in water.

Physiological Effects.—Senega possesses acrid and stimulant properties. In small doses it is diaphoretic, diuretic, and expectorant; in large doses, emetic and purgative. Sundelin (*Handb. d. Spec. Heilmittell.* ii. 176, 3te Aufl.) took a scruple of powdered senega root every two hours, for six hours: it caused irritation of the back part of the tongue and throat, and gave rise to an increased flow of saliva. These effects were soon followed by considerable burning in the stomach, nausea and vomiting. The skin became warmer and moister; there was griping pain of the bowels, followed by watery evacuations; the secretion of urine was increased, and a feeling of heat was experienced in the urinary passages. For some days after there was gastric uneasiness, with loss of appetite. *In larger doses* it caused burning pain in the stomach and bowels, violent vomiting, purging, anxiety, and giddiness.

It appears to excite moderately the vascular system, to promote the secretions (at least those of the kidneys, skin, uterus, and bronchial membrane), and to exert a specific influence over the nervous system. It has been principally celebrated for its expectorant effects.

In its operation on the nervous system it has considerable resemblance to Arnica (see p. 960*). But its influence over the secreting organs is much greater. It is somewhat analogous to Helenium (p. 951) in its action.

Uses.—In this country senega is comparatively but little employed. It is an exceedingly valuable remedy in the latter stages of *bronchial* or *pulmonary inflammation*, when this disease occurs in aged, debilitated, and torpid constitutions, and when the use of depletives is no longer admissible. It appears to re-establish a healthy condition of the secreting organs, to promote the resolution of the morbid deposits, and to give strength to the system. I usually administer it in combination with ammonia, which appears to me to promote its beneficial operation. Frequency of pulse, and a febrile condition of the system, are by no means to be regarded as impediments to the use of this medicine.

In *chronic catarrh* and *humoral asthma* it has also been used. It has been extravagantly praised by Dr. Archer, of Maryland, as a remedy for *croup* (Eberle, *Mat. Med.*) He represents it as being capable, without the aid of any other means, of removing this alarming disease. Few practitioners, I suspect, would venture to trust it. Yet it might be a useful addition to emetics. As a stimulant and promoter of the secretions, it has been used with advantage in the latter stage of low *fever* accompanied with torpidity. It has also been used as an emetic, purgative, and diaphoretic, *in rheumatism*, as a diuretic in *dropsy*, and as an emmenagogue in *amennorrhœa*. It was introduced into practice as a remedy against the bite of venomous animals,—as the rattlesnake.

Administration.—The dose of the *powder* is from grs. x. to ℈j. But the *infusion* or *decoction* is the best form of exhibition.

Decoctum Senegæ, L. E. D. (Senega root, ʒx. [℥iij. *D.*]; Water [distilled, *L.*], Oij. [Oiss. *D.*] Boil down to a pint [℥viij. *D.*], and strain).—Stimulating, expectorant, and diuretic. Dose, f℥j. to f℥iij. three or four times daily. Ammonia is often a valuable addition to it.

Krame'ria trian'dra, Ruiz and Pavon, L. E. D.—*The Ratanhy.*

Sex. Syst. Tetrandria, Monogynia, *Willd.*

(Radix, *L.*—Root, *E.*—Radix et extractum, *D.*)

History.—This plant was discovered by Ruiz and Pavon, in 1779, in South America. It was introduced to notice into this country, as a medicine, by Dr. Reece, in 1808. In 1813, Ruiz's dissertation on it appeared in an English dress (Eckard, *Diss. Inaug. de Rad. Ratanhiæ*. Berol. 1822).

Botany. *Gen. Char.*—*Sepals* four or five, irregular, coloured, spreading, deciduous. *Petals* four or five, irregular, smaller than the calyx, the three inner unguiculate. *Stamens* one, three, or four, hypogynous, unequal. *Ovary* one-celled, or incompletely two-celled; *style* terminal; *stigma* simple; *ovules* in pairs, suspended. *Fruit* between hairy and leathery, globose, covered with hooked prickles, by abortion one-seeded, indehiscent.—Spreading many-stemmed *undershrubs*. *Leaves* alternate, simple, entire or three-foliate, spreading. *Racemes* simple, spiked (*Lindley*).

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* By a typographical error at p. 260, l. 7 from the bottom, Arnica is said to be allied in operation to "*vinegar.*" For vinegar, read "*senega.*"

SP. CHAR.—*Leaves* oblong, somewhat acute, villous-silky. *Pedicels* somewhat longer than the leaf, bitracteate, forming a short *raceme* (D. C.)

Suffruticose. *Root* long, branching. *Stem* procumbent, branching. *Leaves* sessile, covered on both surfaces with long, silky leaves. *Flowers* solitary, lake-coloured. *Stamens* three. *Drupe* round, beset with stiff reddish hairs.

HAB.—Peru; growing abundantly in Huanuco, Huamalies, and Canta.

DESCRIPTION.—Ratanhy root (*radix krameriæ* seu *rhatanhiæ*) is brought from Peru. It consists of numerous, woody, cylindrical, long branches, varying in thickness from that of a writing quill upwards. These pieces consist of a slightly fibrous, reddish-brown bark, having an intensely astringent and slightly bitter taste,—and of a very hard, ligneous, meditullium, of a yellowish or pale red colour. The largest quantity of astringent matter resides in the bark, and therefore the smaller branches (which have a larger proportion of bark) are to be preferred.

Foreign or *South American extract of rhatany* (*extractum krameriæ* seu *rhatanhiæ americanum*) is occasionally imported.

COMPOSITION.—Rhatany root has been analyzed by Trommsdorf, Vogel, C. G. Gmelin, and Peschier (L. Gmelin, *Handb. d. Chem.* ii. 1250).

C. G. Gmelin.

Tannin	38·3
Sweet matter	6·7
Mucilage	8·3
Nitrogenous ditto	2·5
Lignin	43·3
[Loss	0·9]
Rhatany root	100·0

Peschier.

Dried watery extract	31·25
Insoluble matters	68·75
Rhatany root	100·00
Tannin	42·6
Gallic acid	0·3
Gum, extractive and colouring matter	56·6
Krameric acid	0·5
Dried watery extract of rhatany root	100·0

1. *Tannic acid.*—To this, as well as in part to a minute portion of gallic acid, rhatany root owes its astringent qualities. It is this acid which enables an infusion of rhatany root to form, with a solution of gelatine, a precipitate (*tannate of gelatine*), and with sesquichloride of iron a brownish grey precipitate (*tannate of iron*). The properties of tannic acid have been already described (see p. 735).

2. *Krameric acid.*—Peschier ascribes the stypticity of rhatany to this acid, the properties of which are at present imperfectly known.

PHYSIOLOGICAL EFFECTS.—A powerful astringent, and, like other agents of this class, tonic also. (See the effects of astringents, p. 79.)

USES.—Rhatany root is adapted to all those cases requiring the employment of astringents: such as *profuse mucous discharges* (as humid catarrh, old diarrhœas, fluor albus, &c.), *passive hemorrhages* (especially metrorrhagia), and *relaxation* and *debility of the solids.* It is sometimes used as a *tooth powder* (as with equal parts of orris root and charcoal). Dentists sometimes employ tincture of rhatany diluted with water *as an astringent mouth wash.*

ADMINISTRATION.—The *powder* may be given in doses of from grs. x. to ʒss. The *infusion* or *extract* is more commonly employed. *Compound* *tincture of rhatany* is prepared by digesting ℥iij. of bruised rhatany root, and ℥ij. of orange peel in Oj. of proof spirit. Sometimes ℥ss. of serpentary root and ʒj. of saffron are added. It is an efficacious astringent and stomachic. Dose, fʒj. to f℥iij.

1. *Infusum Krameriæ*, L.—(Krameria, ℥j.; Boiling distilled Water, Oj. Macerate for four hours in a lightly covered vessel, and strain). Astringent and tonic. Dose, f℥j. to f℥ij.

2. *Extractum Krameriæ*, E. D.—(Prepared as extract of liquorice [p. 1137] *E.*) Astringent. Dose, grs. x. to ℈j.

Order 75. Viola'ceæ, *Lindley*.—The Violet Tribe.

Violarieæ. *Decandolle.*

Essential Character.—*Sepals* five, persistent, with an imbricate æstivation, usually elongated at the base. *Petals* five, hypogynous, equal or unequal, usually withering, and with an obliquely convolute æstivation. *Stamens* five, alternate with the petals, occasionally opposite them, inserted on a hypogynous disk, often unequal; *anthers* bilocular, bursting inwards, either separate or cohering, and lying close upon the ovary; *filaments* dilated, elongated beyond the anthers; two, in the regular flowers, generally furnished with an appendage or gland at their base. *Ovary* one-celled, many-seeded, or rarely one-seeded, with three parietal placentæ opposite the three outer sepals; *style* single, usually declinate, with an oblique hooded *stigma*. *Capsule* of three valves, bearing the placentæ in their axis. *Seeds* often with a tumor at their base; *embryo* straight, erect, in the axis of fleshy *albumen.—Herbaceous* plants or *shrubs*. *Leaves* simple, usually alternate, sometimes opposite, stipulate, entire, with an involute *vernation*. *Inflorescence* various.

Properties.—Roots more or less emetic.

Vi'ola odora'ta, Linn. E. D.—*The Sweet Violet.*

Sex. Syst. Pentandria, Monogynia.

(Flowers, *E.*—Flores, *D.*)

History.—According to Dr. Sibthorp (*Prod. Fl. Græc.* i. 147) this is the Ἴον πορφυρόεν (*purple violet*) of Dioscorides (lib. iv. cap. 122). It was employed in medicine by Hippocrates.

Botany. *Gen. Char.—Sepals* five, unequal, prolonged into appendages at the base. *Corolla* unequal, two-lipped, of five petals, the lower calcarate. *Capsule* bursting with elasticity, many-seeded, three-valved. —*Herbaceous* plants (*Lindley*).

Sp. Char.—Stigma uncinate, naked. *Leaves* rounded-cordate. *Sepals* ovate, obtuse. *Spur* very blunt. *Capsule* turgid, hairy. *Seeds* turbinate, pale. *Runners* flagelliform (D. C.)

Perennial. Flowers fragrant, deep purple, often white, occasionally lilac. *Bracts* inserted above the middle of the scape.

Hab.—Indigenous. Flowers in March and April. Cultivated on account of the odour and colour of the flowers.

Description.—Violets (*flores violæ odoratæ*) should be gathered immediately they are expanded, as they subsequently become purplish. Their delightful fragrance is well known. The root of the violet *(radix violæ odoratæ)* has been used in medicine.

Composition.—In 1822, Pagenstecher (Gmelin, *Handb. d. Chem.* ii. 1249) detected the following substances in an infusion of the flowers:—*odorous principle, blue colouring matter, sugar* both *crystallizable* and *uncrystallizable*, *gum*, *albumen*, and *salts of potash* and *lime*. Boullay (*Journ. de Pharm.* x. 23) obtained from the *root*, *leaves*, *flowers*, and *seeds*, an acrid principle, which he has termed *violine*.

1. *Odorous principle.*—This has not been isolated. It is supposed, however, to be of the nature of volatile oil. By digesting violets in olive oil, the latter dissolves the odorous matter, and acquires the smell of violets; this preparation is the *oil of violets*, —the *huile de violette* of perfumers. The *eau*, or *esprit de violette*, is nothing more than an alcoholic tincture of the rhizome of the Florentine orris (p. 677), which has an odour similar to that of the violet.

2. *Colouring matter.*—It is soluble in water, but not in alcohol. It is changed to red by the strong acids, and to green by the alkalies: hence the expressed juice and syrup are valuable as tests for discovering the existence of either acids or alkalies. An infusion of violets has been said to contain three kinds of colouring matter; namely, a *blue colouring matter*, not precipitable by the acetate of lead, but which is completely decolorized by sulphuretted hydrogen; secondly, a *bright-red acid colouring matter*, which causes a bluish-green precipitate with the solution of acetate of lead; thirdly, a *violet-red colouring matter*, which does not precipitate the neutral acetate of lead, but throws down a greenish-yellow precipitate with the subacetate of lead.

3. *Violine* (*Emétine indigène*).—It was at first mistaken for *emetina* (p. 1019). Its nature requires further investigation. It is a white powder, of a bitter, acrid taste, slightly soluble in water, soluble in alcohol, and insoluble in ether. It is precipitated from its solution by infusion of nutgalls. Its operation is similar to that of emetine.

Physiological Effects.—The *odorous emanations* of violets, like those of some other flowers, are said to have occasionally proved dangerous, and in one case were supposed to have brought on apoplexy (Triller, quoted by Murray, *App. Med.* i. 778). Dr. Lindley (*Fl. Med.*) has known them cause faintness and giddiness. *Taken internally*, violets act as laxatives. The *seeds* possess similar properties. The *root*, in doses of from ʒss. to ʒj., proves emetic and purgative.

Uses.—Violets are employed in the preparation of the officinal syrup. They are useful as a test for acids and alkalies, and are much sought after for bouquets. The root might be employed as a substitute for ipecacuanha.

Syrupus Violæ, E. D. *Syrup of Violets.* (Fresh Violets [the petals, *D.*] lb. j. [lb. ij. *D.*]; Boiling Water, Oijss. [Ov. *D.*]; Pure Sugar, lb. vijss. [lb. xij. and ℥j. *D.*] Infuse the flowers for twenty-four hours in the water [in a covered glass or earthenware vessel, *E.*]; strain [through fine linen, *D.*] without squeezing, and dissolve the sugar in the filtered liquor).—The colour of this preparation is improved by making it in a tin or pewter vessel. No satisfactory explanation of this has been offered. The Edinburgh College, fearful, I presume, of a metallic impregnation, direct glass or earthenware vessels to be employed.—Genuine syrup of violets is readily distinguished from any counterfeit by its being reddened by an acid, and made green by an alkali. Hence it is employed as a test.—As a medicine it is used as a mild laxative for new-born infants. Thus, a mixture of equal parts of oil of almonds and syrup of violets is often administered, in the dose of one or two tea-spoonfuls, for the purpose mentioned.

Other Medicinal Violaceæ.

The roots of several species of *Ionidium* possess emetic qualities, and have been employed as substitutes for our officinal ipecacuanha (*Cephaëlis Ipecacuanha*).

The root of *Ionidium Ipecacuanha*, a native of the Brazils, is termed *false Brazilian* *ipecacuanha.* It yielded Pelletier five per cent. of emetine. The dose of it, as an emetic, is ʒss to ʒj. infused in water.

The root of *Ionidium microphyllum*, or the *Cuchunchully*, a native of Quito, possesses similar properties.

ORDER 76. CISTA'CEÆ, *Lindley*.—THE ROCK-ROSE TRIBE.

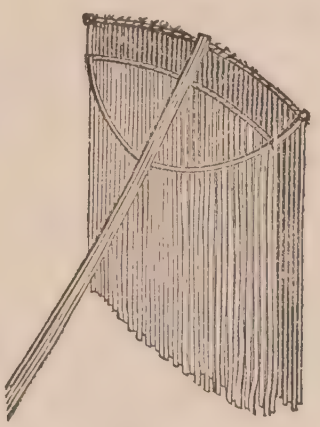
CISTI, *Jussieu*. CISTÖIDEÆ, *Ventenat*. CISTINEÆ, *Decandolle*.

The substance called *Ladanum* is a resinous exudation from the *Cistus creticus*, growing, as its name implies, in Crete. In the time of Dioscorides it was collected by combing the beards of the goats which browse on the plant. According to Tournefort (*Voy. into the Levant*, i. 79, 1741) and Sieber, it is now collected by a kind of whip or rake, with a double row of leathern thongs. With this the countrymen brush the plants, and when the whips are sufficiently laden with the juice, it is scraped off by knives, and made into cakes. Pure ladanum consists of *resin* and *volatile oil* 86, *wax* 7, *aqueous extract* 1, and *earthy matters and hairs* 6 (Guibourt). Pelletier found 72 per cent. of sand in it. It possesses stimulant properties, and was formerly a constituent of some plasters. Its use is now obsolete.

FIG. 235.

Cistus creticus.

FIG. 236.



Ladanum Whip.

ORDER 77. CRUCIF'ERÆ, *Jussieu*.—THE CABBAGE OR CRUCIFEROUS TRIBE.

BRASSICACEÆ, *Lindley*.

ESSENTIAL CHARACTER.—*Sepals* four, deciduous cruciate. *Petals* four, cruciate, alternate with the sepals. *Stamens* six, of which two are shorter, solitary, opposite the lateral sepals, and occasionally toothed; and four larger, in pairs, opposite the anterior and posterior sepals, generally distinct, sometimes connate, or furnished with a tooth on the inside, *Disk* with various green glands between the petals and the stamens and ovary. *Ovary* superior, unilocular, with parietal placentæ usually meeting in the middle, and forming a spurious dissepiment. *Stigmas* two, opposite the placentæ. *Fruit* a silique or silicule, one-celled, or spuriously two-celled; one- or many-seeded; dehiscing by two valves separating from the replum; or indehiscent. *Seeds* attached in a single row by a funiculus to each side of the placentæ, generally pendulous. *Albumen* none. *Embryo* with the radicle folded upon the cotyledons.—*Herbaceous* plants, annual, biennial, or perennial, very seldom suffruticose. *Leaves* alternate. *Flowers* usually yellow or white, seldom purple (*Lindley*).

PROPERTIES.—Pungent stimuli. They furnish nutritive, condimentary, and antiscorbutic substances. Their pungency depends on an acrid volatile oil, composed of *carbon*, *nitrogen*, *hydrogen*, *sulphur*, and *oxygen*. This oil becomes absorbed, and in some cases is detectable in the secretions. The nutritive properties of cruciferæ arise from their mucilaginous, saccharine, and extractive constituents. *Cakile maritima* is purgative. *Cheiranthus lividus* is said to be dangerous to goats; while *Lepidium piscidium* we are told stupefies fish. These statements, however, require further proof. With these doubtful exceptions none of the cruciferæ are poisonous.

FIG. 237.

A Silique.

Cardam'ine praten'sis, Linn. L. D.—*Cuckoo-flower.*

Sex. Syst. Tetradynamia, Siliquosa.

(Flores, *L. D.*)

History.—Brunfels and Tragus are the earliest writers in whose works an undoubted notice of this plant appears. (Sprengel, *Hist. Rei Herb.*)

Botany. *Gen. Char.*—*Silique* linear, with flat, nerveless valves, which often separate elastically. *Seeds* ovate, not bordered (O =). *Umbilical cords* slender (*D. C.*)

Sp. Char.—*Leaves* pinnatisect; segments of the radical ones somewhat rounded—of the cauline ones, linear or lanceolate, entire. *Style* very short, scarcely more slender than the silique; *stigma* capitate (D. C.)

Root perennial. *Stem* about a foot high. *Flowers* light purple, flesh-coloured, or white.

Hab.—Indigenous; meadows and moist pastures. Flowers in April and May.

Description.—The flowers (*flores cardamines*) are somewhat bitter and pungent, and have a slight odour. By drying they become inodorous and almost insipid. The *leaves* possess a flavour analogous to, though less agreeable than, the common water-cress.

Composition.—I am unacquainted with any analysis of the plant worth quoting. The pungency depends on *volatile oil*, the bitterness on *extractive matter*. A few experiments on this plant are mentioned by Gronhert (*Spec. Inaug.* Resiomonti. 1785).

Physiological Effects and Uses.—The flowers of Cardamine are said to be stimulant, diaphoretic, diuretic, and nervine. They were formerly used in epilepsy, especially when it occurred in children, but have now fallen into almost total disuse. They were recommended by Sir George Baker (*Med. Trans.* i. 442) in chorea and spasmodic asthma. Dose of the dried flowers, ʒij. or ʒiij.

Cochlea'ria Armora'cia, Linn. L. E. D.—*Horse-radish.*

Sex. Syst. Tetradynamia, Siliculosa.

(Radix recens, *L.*—Fresh root, *E.*—Radix, *D.*)

History.—Sprengel (*Hist. Rei Herb.* i. 182) considers this plant to be the ῥαφανὶς ἀγρία of Dioscorides (lib. ii. 138); and Dierbach (*Arzneim. d. Hippok.* 125) suggests that it was known to Hippocrates. But these opinions are by no means well established.

Botany. *Gen. Char.*—*Silicule* sessile, ovate-globose or oblong, with ventricose valves. *Seeds* many, not bordered. *Calyx* equal, spreading. *Petals* entire. *Stamens* not toothed.—(O =). *Flowers* white. *Leaves* often somewhat fleshy (D. C.)

Sp. Char.—*Silicules* ellipsoid. Radical *leaves* oblong, crenate; cauline ones elongated, lanceolate, dentate or incised. *Root* fleshy, large (D. C.)

Root perennial, long, cylindrical, white, very pungent. *Stems* two feet high. *Leaves* much veined. *Flowers* white.

Hab.—Indigenous; extensively cultivated. Flowers in May.

Description.—Horse-radish root (*radix armoraciæ; radix raphani rusticani*) evolves, when scraped into shreds, a highly penetrating, acrid vapour. Its taste is very pungent. It is coloured blue by tincture of iodine. An infusion of it is tinged reddish yellow by the sesquisalts of iron.

Composition.—Horse-radish root was analyzed by Gutret (Gmelin, *Handb. d. Chem.* ii. 1248), who found its constituents to be—*acrid volatile oil, bitter resin, extractive, sugar, gum, starch, woody fibre, vegetable albumen, acetic acid*, and *acetate* and *sulphate of lime*.

Volatile Oil (Oleum Armoraciæ).—Obtained by distillation without water. It is pale yellow, heavier than water, and very volatile. Its odour is exceedingly powerful, and like that of horse-radish. One drop is sufficient to infect a whole room. Its taste is at first sweetish, then burning and acrid. It causes inflammation and vesication when applied to the skin. It is slightly soluble in water, easily so in alcohol. The watery solution yields, with acetate of lead, a brown precipitate (*sulphuret of lead*); with nitrate of silver, a black one (*sulphuret of silver*).

Physiological Effects.—Horse-radish is a well-known pungent, acrid stimulant, capable of producing vesication when applied to the skin, and of causing vomiting when taken, in the form of infusion, into the stomach. Its odorous emanations readily excite a copious flow of tears. On the general system it operates as a stimulant, and promotes both urine and perspiration.

Uses.—Scraped into shreds, it is used at the table as a condimentary accompaniment to roast beef. It is not much employed as a medicine. Chewed, it serves as an excellent masticatory. Taken in this way, or in the form of syrup, it may be serviceable in some forms of hoarseness. An infusion of it may be taken to excite vomiting, or to promote the operation of other emetics, as in poisoning by narcotic substances. As a general stimulant, diaphoretic, and diuretic, it has been used in palsy, chronic rheumatism, and dropsy. It is one of the remedies deemed antiscorbutic.

Administration.—Dose, ʒss. or more, scraped into shreds.

1. *Infusum Armoraciæ compositum*, L. D. (Horse-radish, sliced; Mustard-seeds, bruised, of each ℥j.; Compound Spirit of Horse-radish, f℥j.; Boiling [distilled, *L.*] Water, Oj. Macerate the root and seeds in the water for two [six, *D.*] hours, in a lightly covered vessel, and strain. Then add the compound Spirit of Horse-radish).—This preparation soon undergoes decomposition. It is stimulant and diuretic, and has been employed in chronic rheumatism, paralysis, dropsies, and scurvy. Dose, f℥j. to f℥ij.

2. *Spiritus Armoraciæ compositus*, L. D. (Horse-radish, bruised; Dried Orange Peel, of each, ℥xx.; Nutmegs, bruised, ʒv.; Proof Spirit, *Cong.* i.; Water, Oij. Mix [macerate for twenty-four hours, *D.*], and let a gallon distil. The proportions of ingredients used by the Dublin College are not essentially different from those of the London College).—Usually employed as a stimulating adjunct to other medicines, especially to diuretic infusions. Dose, fʒj. to fʒiv.

Cochlea'ria officina'lis, Linn. D.—*Common Scurvy-grass.*

Sex. Syst. Tetradynamia, Siliculosa.

(Herba, *D.*)

History.—This plant does not appear to have been known to the ancients.

BOTANY. *Gen. Char.*—See COCHLEARIA ARMORACIA.

Sp. Char.—*Silicules* ovate-globose, twice as short as their pedicels. Radical *leaves* stalked, cordate; cauline ones ovate dentate-angular (*D. C.*)—*Annual. Stem* about a foot high. *Flowers* pure white.

Hab.—Indigenous; on the sea-coast, and in watery places on the Welsh and Scottish mountains. Cultivated in gardens.—Flowers in April and May.

DESCRIPTION.—Scurvy-grass (*herba cochleariæ*) evolves, when rubbed, a somewhat pungent odour. Its taste is penetrating and acrid.

COMPOSITION.—The *inspissated juice* was examined by Braconnot (*Journ. Phys.* lxxxiv. 278), and the *fresh herb* by Gutret (Gmelin, *Handb. d. Chem.* ii. 1248). The latter obtained the following constituents:—*volatile oil, bitter resin, bitter extractive, gum, green fecula, vegetable albumen, hydrochlorate* and *sulphate of ammonia, nitrate* and *sulphate of lime.*

Volatile Oil (*Oleum Cochleariæ*).—This is yellow, heavier than water, very volatile, and soluble in alcohol. Its odour is strong, and its taste acrid.

PHYSIOLOGICAL EFFECTS AND USES.—A gentle stimulant, aperient, and diuretic. It has long been esteemed as an antiscorbutic (see Valentinus, *Cochlearia curiosa*, by Shirley. 1676). It has also been used in visceral obstructions. It is occasionally eaten with bread and butter, like the water-cress.

Sina'pis ni'gra, Linn. L. E. D.—*Common or Black Mustard.*

Sex. Syst. Tetradynamia, Siliquosa.

(Semina, *L.*—Flour of the seeds, generally mixed with those of Sinapis alba, and deprived of fixed oil by expression, *E.*—Seminum pulvis, *D.*)

HISTORY.—Mustard (νάπυ) was employed in medicine by Hippocrates.

BOTANY. *Gen. Char.*—*Silique* somewhat terete; the valves nerved. *Style* small, short, acute. *Seeds* in one row, somewhat globose. *Calyx* spreading (*D. C.*)

Sp. Char.—*Siliques* smooth, even, somewhat tetragonal, pressed close to the peduncle. Lower *leaves* lyrate; upper ones lanceolate, quite entire, stalked.—*Annual. Stem* three or four feet high. *Flowers* yellow.

FIG. 238.

a. Sinapis alba.
b. Sinapis nigra.

Hab.—Indigenous; hedges and waste places. Cultivated in fields, especially in Durham and Yorkshire.

DESCRIPTION.—Black mustard seeds (*semina sinapis nigræ*) are small and roundish. Externally they are beautifully veined, and of a reddish- or blackish-brown colour, though sometimes whitish. Internally they are yellow. They are inodorous, but have an acrid, bitter, oleaginous taste.

MANUFACTURE OF MUSTARD.—The following method of preparing *flour of mustard* (*farina sinapis*) was kindly furnished me by a large manufacturer:—The seeds of both black and white mustard are first crushed between rollers, and then pounded in mortars. The pounded seeds are then sifted. The residue in the sieve is called *dressings* or *siftings*: what passes through is *impure flour of mustard*. The latter by a second sifting yields *pure flour of mustard*, and a second quantity of dressings. The *common flour of mustard* of the shops is adulterated with flour (wheaten), coloured by turmeric, and rendered hot by pod pepper. By pressure the dressings or siftings yield a fixed oil (*fixed oil of mustard*), which is used for mixing with rape and other oils. The whole seeds are never pressed. Mustard cake is employed as a manure, being too hot for cattle.

COMPOSITION.—Black mustard seed was analyzed by Thibierge (*Journ. de Pharm.* tom. v. p. 439). Some of its constituents have subsequently been examined by Henry fils and Garot (*Journ. de Chim. Méd.* i. 439 and 467; and *Journ. de Pharm.* xvii. 1); by Pelouze (*Journ. de Chim. Méd.* vi. 577); by Robiquet and Boutron (*Journ. de Pharm.* xvii. 290); by Fauré (*Ibid.*); by Simon (*Ibid.* xxv. 366); by Bussy (*Ibid.* xxvi. 39); and by Boutron and Frémy (*Ibid.* p. 48). From their labours we learn that black mustard seed contains *myronate of potash, myrosyne, fixed oil, a pearly fatty matter, gummy matter, sugar, colouring matter, sinapisin, free acid, peculiar green matter*, and some *salts*.

1. *Myronic acid.*—So called by Bussy, its discoverer, from μύρον, *an odorous oil*. It is an inodorous, non-volatile, bitter, non-crystallizable acid. It is soluble in water and alcohol, but not in ether. It is composed of *carbon, sulphur, hydrogen, nitrogen*, and *oxygen*. The alkaline myronates are crystallizable. Myronate of potash yields no precipitate with nitrate of silver, nitrate of baryta, acetate of lead, bichloride of mercury, or chloride of calcium. The characteristic property of myronic acid is, to yield the *volatile oil of mustard* when mixed with a solution of myrosyne.

2. *Myrosyne; Emulsin of black mustard.*—Bussy called it myrosyne, from μύρον, *odorous oil*, and συν, *with*, because it yields, with myronic acid, the volatile oil of mustard. It has considerable resemblance to vegetable albumen and emulsin, but as it cannot be replaced by either of these substances, in the development of the volatile oil, it must be regarded as a substance *sui generis*. It is soluble in water; but is coagulated by heat, alcohol, and acids, and in this state it loses the power of acting on the myronates and of yielding the volatile oil.

3. *Sinapisin.*—This term has been given, by Simon, to a substance which he procured from black mustard seeds, and which he states possesses the following properties:—It presents itself in the form of white, brilliant, micaceous, volatile crystals, which are soluble in alcohol, ether, and the oils, but are insoluble in acids and alkalies. When mixed with the albumen of the mustard-seed, it yields the volatile oil of mustard. Bussy ascribes this last property to myronic acid; but it is highly improbable that two constituents of mustard should possess it. Analogy would lead us to suppose that the oil is generated by non-acid substances. Simon says sinapisin contains no sulphur.

4. *Volatile Oil of Mustard.*—This does not pre-exist in the seeds; but is formed when water is added to the farina, by the mutual action of the contained myrosyne and myronate of potash (sinapisin?); just as the volatile oil of bitter almonds is generated by the mutual action of emulsin, amygdalin, and water (see p. 1106). Alcohol extracts from the farina no volatile oil, and by coagulating the myrosine renders the farina incapable of developing the oil by the subsequent action of water. Sulphuric acid and the other mineral acids, as well also as carbonate of potash, check the formation of the oil. But when the oil is once formed, the acids have no power to prevent its effects. Volatile oil of mustard is colourless or pale yellow; it has a most penetrating odour, and a most acrid burning taste. Its sp. gr. at 68° F. is 1·015. It boils at 290° F. It is slightly soluble in water, but readily so in alcohol and ether. By the action of ammonia on this oil, an odourless, crystallizable substance (an *amide*) is produced, which consists of one atom of the oil and two atoms of ammonia (Dumas and Pelouze, *Journ. de Chim. Méd.* ix. 645). These crystals are decomposed with the greatest facility by binoxide of mercury (Robiquet and Bussy, *Journ. de Pharm.* xxvi. 119). Volatile oil of mustard consists of *carbon* 49·84, *hydrogen* 5·09, *nitrogen* 14·41, *oxygen* 10·18, and *sulphur* 20·48; or $C^{16} H^{10} N^2 O^{2\frac{1}{2}} S^{2\frac{1}{2}}$. It is a powerful acrid, rubefacient, and vesicant. It has been proposed as

a rubefacient in paralysis, and as a vesicant. The *distilled water of mustard* has been employed against the itch (Fontanelle, *Journ. de Chim. Méd.* i. 131).

5. *Fixed Oil of Mustard.*—Usually procured from the dressings or siftings of mustard, above referred to. It constitutes about 28 per cent. of the seeds. Its colour is reddish- or brownish-yellow; it has a faint odour of mustard, and a mild oily taste. It does not readily become rancid. It has been used as a purgative and anthelmintic (Fontanelle, *op. supra cit.* 131).

Physiological Effects.—Mustard is an acrid stimulant belonging to the group of the *volatile pungent stimuli* (see p. 71). It holds an intermediate rank between horse-radish and pepper. Its topical action is that of a powerful acrid, and depends on the volatile oil developed by the action of water. The irritant operation on the eyes of the vapour arising from a mixture of hot water and flour of mustard, is familiarly known. Mustard cataplasms cause redness and burning pain, which, if the application be continued, becomes almost insupportable. A prolonged application causes vesication with even ulceration and gangrene. Compared with those of cantharides, the topical effects on the skin of mustard sooner subside when the application is discontinued. When swallowed, mustard evinces the same stimulant operation on the stomach and bowels. Taken *in moderate quantities*, with the food, it promotes the appetite, and assists the assimilation of substances which are difficult of digestion. *In somewhat larger doses* (as one or two tea-spoonfuls) it rouses the gastric susceptibility, and operates as an emetic. *In excessive quantities* it gives rise to vomiting, purging, and gastro-enteritis. The effects of mustard on the general system are those of a stimulant. It quickens the pulse, and promotes the secretions (especially the urine) and the exhalations.

Uses.—The *dietetical* uses of mustard are well known. It is well adapted for cold, phlegmatic individuals, with a torpid or atonic condition of the digestive organs. It is an excellent condimentary adjunct to heavy and difficultly digestible foods, as fatty matters.

As a *medicinal* agent, mustard is employed for several purposes. As an *emetic* it is useful where we want to rouse the gastric sensibility, as in narcotic poisoning, malignant cholera, and some forms of paralysis. (On the use of mustard emetics in cholera, see *Lond. Med. Gaz.* vol. ix. pp. 519, 592, and 795).

As a stimulant to the digestive organs it is applicable in atonic or torpid conditions of these parts, with dyspepsia, loss of appetite, and hepatic torpor. *As a diuretic* it has been employed with some benefit in dropsy (Mead, *Works*, p. 514, 1762). As a *febrifuge* in intermittents, it has been employed either alone or in conjunction with cinchona (Bergius, *Mat. Med.* ii. 618, 2nd ed.) But the principal use of mustard is as a *rubefacient* (see *Cataplasma Sinapis*). Flour of mustard is sometimes added to pediluvia.

Administration.—As an *emetic* the dose is from a tea-spoonful to a table-spoonful of the flour of mustard in a tumblerful of water. As a *diuretic* in dropsies and for some other purposes *mustard whey* (*serum lactis sinapinum*) is a convenient form of exhibition. It is prepared by boiling half an ounce of the bruised seeds or powder in a pint of milk, and straining: the dose is f℥iv. twice or thrice a-day.

Cataplasma Sinapis, L. D. *Sinapismus. Mustard Poultice* or *Sinapism.* (Linseed; Mustard-seed, of each, powdered, lb.ss.; Boiling Vinegar, as much as may be sufficient to make them of the consistence of a cataplasm [which may be made more stimulating by adding ℥ij. of the scrapings of horse-radish root, *D.*]). Crumb of bread may be often conveniently substituted for linseed meal. Vinegar and other acids check the formation of the acrid oil. Boiling water also has an injurious effect. Hence water whose temperature does not exceed 100° F. is to be preferred for making the mustard poultice. Aetius (*Sermo* iii. cap. 181) was acquainted with the injurious influence exercised by vinegar on mustard; and he observes,—"*Sed et hoc noscendum est: si in aceto maceretur sinapi inefficatus redditur: Acetum enim sinapis vim discutit.*" Several experiments on this subject have been made by Trousseau and Pidoux (*Traité de Thérap.* i. 692). They found that a sinapism made with flour of black mustard and water produced as much effect in six minutes as one made with the flour of black mustard and vinegar did in fifty. Curiously enough, however, they state that vinegar did not diminish the activity of English flour of mustard. This, perhaps, is referrible to the fact that common English flour of mustard contains pod pepper, the active principle (*capsicin*) of which is soluble in vinegar (see p. 878).—The mustard cataplasm is a powerful local irritant. It readily excites inflammation, and, when allowed to remain applied sufficiently long, causes vesication. It proves, in many cases, a most painful application. In various affections of the brain (as in the stupor and delirium of low fever, in apoplexy, and in poisoning by opium) it is a most valuable application to the feet and ankles. In pulmonary and cardiac diseases it is occasionally applied to the chest with excellent effects. Dr. Blackall (*Observ. on Dropsies*, p. 339, 4th ed. 1824) speaks in high terms of the mustard cataplasm, quickened with oil of turpentine, in typhoid pneumonia. Of course, in all these cases, it operates on the principle of a blister, over which its speedy effect gives it a great advantage. It is applied spread on linen or calico. Great caution is necessary in its application to persons who are insensible to pain; for if it be continued too long it may occasion ulceration and sloughing, though no pain be manifested. Hence its effects should be examined at short intervals. In one case death had nearly resulted from the neglect of this caution. Four sinapisms were applied to the wrists and insteps of a female lying in a comatose condition following puerperal convulsions. As no manifestation of pain occurred, the application was continued for three hours. Sloughing followed, which had nearly proved fatal (Trousseau and Pidoux, *op. supra cit.* i. 700).

Sin'pis al'ba, Linn. E. D.—*White Mustard.*

Sex. Syst. Tetradynamia, Siliquosa.

(Semina, *D.*—Flour of the seeds of Sinapis nigra, generally mixed with those of Sinapis alba, and deprived of fixed oil by expression, *E.*)

BOTANY. *GEN. CHAR.*—See SINAPIS NIGRA.

SP. CHAR.—*Siliques* hispid, spreading, somewhat narrower than the ensiform beak. *Leaves* lyrate, and, as well as the *stem*, nearly smooth (D. C.)

Annual. Stem one or one-and-a-half foot high. *Flowers* large, yellow. *Beak* longer than the pod.

HAB.—Indigenous; in waste places. Cultivated in both fields and gardens. Flowers in June.

Description.—White mustard seeds (*semina sinapis albæ*) are larger and somewhat less acrid to the taste than the black ones. They consist of rounded-elliptical yellow grains, composed of a yellow nucleus enveloped in a thin semi-transparent shell. The hilum is at one extremity of the ellipse.

Composition.—According to the analysis of John (Gmelin, *Handb. d. Chem.* ii. 1247), white mustard seeds consist of an *acrid volatile oil*, *yellow fatty oil*, *brown mild resin*, *extractive* (very small quantity), *gum* (small quantity), *woody fibre*, *albumen*, *free phosphoric acid*, and *salts*.

Robiquet and Boutron (*Journ. de Pharm.* xvii. p. 279), however, have proved that white mustard contains neither volatile oil nor any substance capable of producing it; but owes its activity to *a non-volatile acrid substance* which does not pre-exist in the seeds, but is readily formed in them under certain conditions. Another chemical peculiarity of white mustard is, that it contains *sulpho-sinapisin* (Henry and Garot, *Journ. de Chim. Méd.* i. 441). Hence, while sesquichloride of iron strikes a deep red colour in an infusion of white mustard, it merely communicates an orange tint to the infusion of black mustard. Moreover, the thick mucilaginous liquor obtained by digesting the seeds of white mustard in cold water is peculiar to them (Cadet, *Journ. de Pharm.* xiii. 191). Simon (*Journ. de Pharm.* xxv. 370) has announced the existence of a new principle, which he calls *erucin*.

1. *Sulphosinapisin.*—It was at first supposed to be an acid, and was in consequence called, by Henry and Garot (*Journ. de Chim. Méd.* i. 439), *sulphosinapic acid*. But they subsequently established its non-acid properties. It is a white, crystallizable, odourless, bitter substance, soluble in water, alcohol, and ether. Under the influence of various agents (acids, oxides, and salts) it readily yields hydrosulphocyanic acid. To this acid is probably to be ascribed the red colour developed when a persalt of iron is added to an aqueous infusion of black mustard. Its aqueous solution forms, with nitrate of silver, a white precipitate. Boutron and Fremy state that sinapin, under the influence of emulsin, is converted into an acrid substance and hydrosulphocyanic acid. Sinapin consists of *carbon* 57·920, *hydrogen* 7·795, *nitrogen* 4·940, *sulphur* 9·657, and *oxygen* 19·688; or $C^{24} H^{22} N S^2 O^7$.

2. *Non-volatile acrid principle.*—This does not pre-exist in white mustard, but is readily developed in it by cold water. As before mentioned, Boutron and Fremy (*Journ. de Pharm.* xxvi. 50) ascribe its formation to the action of the emulsin of the seed on the sinapin, by which hydrosulphocyanic acid and this acrid matter are produced. The latter substance is an unctuous, reddish, odourless liquid, which has the pungent hot taste of horse-radish. It contains sulphur as one of its constituents.

3. *Erucin.*—A yellowish-white substance which is very soluble in ether, carburet of sulphur, and turpentine. It dissolves in boiling alcohol, but is insoluble in water and solution of ammonia. It does not redden the salts of iron, and contains no sulphur.

Physiological Effects.—Similar to, though milder than, those produced by black mustard. Swallowed whole, the seeds prove stomachic, laxative, and diuretic. But their use, in the large quantities in which they have been recommended, is by no means free from danger. Gastro-enteritic inflammation of a fatal kind has been induced by them. The danger of their accumulation in the appendix cæci is obvious. Mr. J. L. Wheeler (*Cat. Rat. Plant. Med.* Lond. 1830) has known them retained in the bowels for seven weeks.

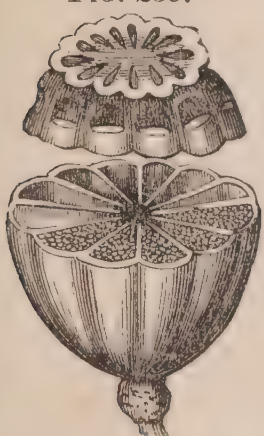
Uses.—Dr. Cullen (*Mat. Med.* ii. 171) first mentions the practice of giving half an ounce, or an ordinary table-spoonful, of entire and unbruised mustard-seed. A few years ago it was again brought forward, as if new (C. T. Cooke, *Obs. on the Efficacy of White Mustard-seed*, 3d ed. 1826). Their employment has been advocated in a long list of diseases attended with torpor or atony of the digestive organs; and at one time their use was fashionable and popular. Sir John Sinclair (*Lancet*, Jan. 25th, 1834, p. 669) recommended them for the preservation of the health of old people especially. The seed-leaves of white mustard and of *Lepidium sativum* are used at table under the name of *mustard and cress* or *corn salad.*

ADMINISTRATION.—From two or three large tea-spoonfuls to a table-spoonful of the whole unbruised seed have been recommended to be swallowed three or four times daily.

ORDER 78. PAPAVERA'CEÆ, *Jussieu.*—THE POPPY TRIBE.

ESSENTIAL CHARACTER.—*Sepals* two, deciduous. *Petals* hypogynous, either four or some multiple of that number, placed in a cruciate manner. *Stamens* hypogynous, either eight, or some multiple of four, generally very numerous, often in four parcels, one of which adheres to the base of each petal; *anthers* two-celled, innate. *Ovary* solitary; *style* short or none; *stigmas* alternate with the placentæ, two or many; in the latter case stellate upon the flat apex of the ovary. *Fruit* one-celled, either pod-shaped, with two parietal placentæ, or capsular, with several placentæ. *Seeds* numerous; *albumen* between fleshy and oily; *embryo* minute, straight, at the base of the albumen, with plano-convex *cotyledons.*—*Herbaceous* plants or *shrubs*, with a milky juice. *Leaves* alternate, more or less divided. *Peduncles* long, one-flowered; *flowers* never blue (*Lindley*).

FIG. 239.



Capsule of the Poppy.

PROPERTIES.—The plants of this order possess narcotic and acrid properties. At the head of the narcotic papaveraceæ stands the genus *Papaver*, from which opium is procured. The acrid papaveraceæ usually possess narcotic properties also. *Sanguinaria canadensis* is one of the best known acro-narcotics of this order (Bird, *An Inaug. Dissert. on Sang. canad.* New York, 1822). In doses of from ten to twenty grains it operates as an emetic. In larger doses it causes depression of pulse, faintness, vertigo, dimness of vision, and alarming prostration of strength. Its active principle is an alkali called *sanguinarina*. *Chelidonium majus* is another acrid of this order.

Papa'ver Rhœ'as, Linn. L. E. D.—*Common Red or Corn Poppy.*

Sex. Syst. Polyandria, Monogynia.

(Petala, *L. D.*—Petals, *E.*)

HISTORY.—Theophrastus (*Hist. Plant.* ix. 13) calls the red poppy ῥοιὰς. Dr. Sibthorp (*Prod. Fl. Græc.* i. 359) considers the μήκων ῥοιὰς of Dioscorides (iv. 64) to be the red poppy.

BOTANY. *GEN. CHAR.*—*Sepals* two, convex, deciduous. *Petals* four. *Stamens* numerous. *Style* none. *Stigmas* four to twenty, radiating, sessile upon the disk crowning the ovary. *Capsule* obovate, one-celled, composed of from four to twenty carpels inclosed in a membranous production of the thalamus, dehiscing by short valves under the crown of the stigmas. *Placentæ* between the valves, produced internally, forming incomplete dissepiments (D. C.)—*Herbs* with a white juice. *Peduncles* inflexed at the apex before flowering.

SP. CHAR.—*Capsule* smooth, obovate. *Sepals* hairy. *Stem* many-flowered, rough, with spreading setæ. *Leaves* pinnatipartite; lobes elongated, incised-dentate, acute (D. C.)

Annual. Petals rich scarlet. This plant is distinguished from

Papaver dubium by, 1st, the wide spreading hairs of the flowerstalks; 2ndly, a shorter capsule; 3rdly, its stigma of eight to ten rays.

Hab.—Indigenous. A troublesome weed common in fields. Flowers in June or July.

Description.—The petals of the red poppy (*petala rhœados seu papaveris erratici*) have a rich scarlet colour, a slightly opiate odour, and a bitterish taste. By drying they become violet red, and odourless.

Composition.—The flowers of the red poppy have been analyzed by Beetz and Ludewig (Gmelin, *Handb. d. Chem.* ii. 1246), and by Riffard (*Journ. d. Pharm.* xii. 412). The latter chemist obtained *yellow fatty matter* 12, *red-coloured matter* 40, *gum* 20, *lignin* 28. It is not improbable that this plant may contain *morphia* in very minute quantity.

Red Colouring Matter.—Riffard obtained it, in the impure state, by first macerating the petals in ether to remove a fatty matter, and then in alcohol. By distilling the alcoholic tincture to dryness, a dark-red colouring matter was obtained, which in thin layers was bright red. It was deliquescent in the air, soluble in alcohol and in water, but insoluble in ether. Acids diminished the intensity of its colour. Chlorine decolorized it. The alkalies blackened it. By the last character it is distinguished from the colouring matter of the red cabbage, &c. which becomes green by alkalies. Sesquichloride of iron gives it a dark violet or brown tinge.

Physiological Effects and Uses.—The red poppy is valued medicinally as a colouring ingredient only. It probably possesses a narcotic property in a very slight degree, but which is scarcely sensible in the ordinary doses in which this medicine is employed. Navier (Wibmer, *Wirk. d. Arzneim. u. Gifte.* Bd. iv. S. 47) says that the continued use of the tincture or syrup by dogs, gave the stomach a bluish-red tinge.

Syrupus Rhœados, L. E. D. *Syrup of Red Poppies; Syrup of Corn Poppy.* (Petals of the Red Poppy, lb. j.; Boiling Water, Oj.; Pure Sugar, lb. ijss. [lb. iij. *D.*] Add the petals of the red poppy gradually to the water heated in a water-bath [vapour-bath, *E.*], frequently stirring them; then, the vessel being removed, macerate for twelve hours; afterwards [strain and, *E.*] express the liquor [through calico, *E.*], and [after the dregs have subsided, *L.*] add the sugar and dissolve [with the aid of heat, *E.*])—Employed only as a colouring ingredient, especially in conjunction with acids, which brighten it. It readily ferments and spoils.

Papa'ver somnif'erum, Linn. L. E. D.—*The Somniferous or White Poppy.*

Sex. Syst. Polyandria, Monogynia.

(Capsulæ maturæ. Capsulæ immaturæ Succus concretus, *L.*—Capsules not quite ripe. Concrete juice from the unripe capsules, *E.*—Capsularum succus proprius concretus. Capsulæ maturæ, *D.*)

History.—This is one of the most anciently known and described plants. Homer speaks of the *poppy* (μήκων) growing in gardens (*Il.* viii. 306); so that it appears to have been in cultivation even in that early period. It was employed in medicine by Hippocrates, and is mentioned by Theophrastus, Dioscorides, and Pliny. Hippocrates (*De vict. rat.* lib. ii. p. 357, ed. Fœs.) speaks of two kinds—the *black* and *white poppy*: the former, he says, confines the bowels more than the latter.

It is uncertain at what period *opium* was first known or introduced into medicine. Hippocrates (*De Morb. Mul.* lib. ii. p. 670) recommends the μηκώνιον, or *poppy juice*, in a disease of the uterus; and Dioscorides (lib. iv. cap. 65), on the authority of

Erasistratus, tells us that Diagoras (who was contemporary, it is supposed, with Hippocrates) condemned the use of opium. These are, I believe, the most ancient Greek authorities who speak of this substance; and it is impossible, I think, to arrive at any accurate conclusion from their remarks, whether opium had or had not been known long before their time, though Alston (*Lect. on the Mat. Med.* ii. 456) infers, from the little use made of it by Hippocrates, as well as from Diagoras condemning its use in diseases of the eyes, that its virtues were not known long before him. Dioscorides and Pliny (*Hist. Nat.* lib. xx. cap. 76, ed. Valp.) mention that the expressed juice of the heads and leaves is termed *Meconium*, and that it is much weaker than opium. Theodore Zwinger, Sprengel (*Hist. Rei Herb.* i. 25), and others, have supposed that the *nepenthes* (νηπενθές) of Homer (*Od.* iv. 220) was opium. Dr. Royle (*Illustr.* p. 334), however, has suggested that the substance referred to by Homer may have been a preparation of *Cannabis sativa* (see p. 749), the remarkable effects of which have been recently pointed out by Dr. O'Shaughnessy (*On the Prepar. of the Indian Hemp*, Calcutta, 1839).

The word *opium* is derived from ὀπὸς, *the juice*, and signifies that it is *the juice* par excellence;—just as the flower of the rosemary has been called *anthos*, or *the flower* (see p. 831),—and the cortex cinchonæ,—*the bark.*

BOTANY. *GEN. CHAR.*—See PAPAVER RHŒAS.

SP. CHAR.—*Capsules* obovate or globose, and, as well as the *calyxes*, smooth. *Stem* smooth, glaucous. *Leaves* amplexicaul, cut-repand, dentate, somewhat obtuse (D. C.)

An annual *herb. Root* white, tapering. *Stem* two to six feet high, erect, branched, leafy, glaucous green. *Leaves* alternate, sessile, ovate-oblong, glaucous beneath. *Peduncles* terminal, leafless, with bristly hairs. *Seeds* numerous, small, roundish or reniform, oily, sweet, and edible.

There are two well-marked varieties, which by some botanists are considered to be distinct species:—

α. *nigrum.* P. somniferum, Gmelin.—*Capsules* globose, opening by foramina under the stigma. *Seeds* black. *Peduncles* many. *Flowers* usually violet or red, of different tints, though sometimes white.

β. *album.* P. officinale, Gmelin.—*Capsules* ovate-globose; foramina under the stigma either none or obliterated. *Peduncles* solitary. *Seeds* and *petals* white.

HAB.—Asia and Egypt. Grows apparently wild in some parts of England, but has probably escaped from gardens. Cultivated in Hindostan, Persia, Asia Minor, and Egypt, on account of the opium obtained from it. According to Dr. Royle, var. β. *album* is cultivated in the plains of India; and var. α. *nigrum* in the Himalayas. In Europe the poppy is cultivated for the capsules, either as medicinal agents or for the oil (*poppy oil*) obtained from the seeds, and which is employed in painting. The London market is principally supplied with poppy heads from the neighbourhood of Mitcham, in Surrey.

DESCRIPTION. 1. OF POPPY HEADS.—Poppy heads (*Capsulæ* seu *Capita Papaveris*) are usually collected when quite ripe, as ordered by the London and Dublin Colleges, but they would be more active as medicinal agents if they were gathered while still green; and the Edinburgh College very properly direct the immature capsule to be employed.

As met with in commerce, poppy heads vary somewhat in size, from that of a hen's egg to that of the fist. Their texture is papyraceous: on the top of them is the star-like stigma. They are yellowish or yellowish-brown, and if they have been collected before they were quite ripe, have a bitterish taste. When fresh they have a slightly opiate odour, which they lose by drying. A decoction of the dried poppy capsule is rendered, by the sesquichloride of iron, brownish red (*meconate of iron*). Nitric acid renders it transparent, and communicates a slight orange-red tinge indicative of the presence of morphia.

2. Opium. (*a.*) *Preparation.*—The mode of extracting opium is to a certain extent similar in all countries, and consists in making incisions into the half-ripe poppy capsules, and collecting the exuded juice. According to Dioscorides (lib. iv. cap. 64), Kæmpfer (*Amœn. Exot.* p. 643), Kerr (*Med. Obs. and Inq.* vol. v. p. 317), and Texier, this juice is worked up into a homogeneous mass: whereas Bellonius (*Observ.* lib. iii. cap. 15) and Olivier (*Voy. dans l'Empire Ottoman*), speak of the juice concreting on the poppy; and the first of these writers describes opium as consisting of agglomerated granules. Now Guibourt (*Hist. Abrég.* ii. 3me ed. 1836), by examining the opiums of commerce by means of a magnifier, thinks he has discovered that the Smyrna and Persian (or Trebizon) opium is composed of small agglutinated tears (*opium with a grain*); whereas the Egyptian, and I would add the Indian, opium, is a homogeneous mass, and therefore must have been worked up in the manner described by Dioscorides, Kæmpfer, and others (*homogeneous opium*). One of the latest accounts of the method of obtaining opium is that given by M. Ch. Texier (*Journ. de Pharm.* xxi. 196) of the process followed in Asia Minor:—"A few days after the flower has fallen, men and women repair to the fields and cut the head of the poppy horizontally, taking care that the incisions do not penetrate the internal cavity of the shell. A white substance immediately flows out, and collects in tears on the edges of the cuts. In this state the field is left for twenty-four hours, and on the following day the opium is collected by large blunt knives. Each head furnishes opium once only, and that to an extent of a few grains. The first sophistication which it receives is that practised by the peasants who collect it, and who lightly scrape the epidermis from the shell to augment the weight. This operation adds about one-twelfth of foreign matters. Thus collected, opium has the form of a glutinous and granular jelly. It is deposited in small earthen vessels, and beat up with saliva. When asked why water was not employed in the place of saliva, the answer was that water caused it to spoil. It is afterwards enveloped in dry leaves, and in this state it is sold. The seeds of those poppies which have yielded opium are equally good for sowing the following year."

Some little variation will be found in the descriptions of other writers, of the methods practised in other parts of the East. Kæmpfer says that in Persia the incisions are made cross-wise by a five-edged knife. Kerr states that in the province of Bahar "two longitudinal double incisions" are made "upon each half-ripe capsule, passing from below upwards"; care being taken that the internal cavity of the capsule is not penetrated.

(*b.*) *Description.*—In commerce several varieties of opium are known. The principal kind, however, is that brought from Smyrna.

But the recent events which have occurred in China will probably throw a considerable quantity of Indian opium into European commerce.

1. *Smyrna Opium* (*Opium Smyrnæum*).—This is the *Turkey* or *Levant opium* of commerce. It occurs in irregular rounded or flattened masses of various sizes, rarely exceeding two lbs. in weight, enveloped in leaves, and usually surrounded with the reddish capsules of some species of *Rumex* (*R. orientalis*, according to Koch, in T. W. C. Martius's *Pharmakogn.* S. 322; but *R. Patientia*, according to Merat, *Dict. Mat. Méd.* t. v. p. 50). Some of the flat cakes are without these capsules, and somewhat resemble Constantinople opium. When first imported, the masses are soft, and of a reddish-brown colour; but by keeping they become hard and blackish. Its lustre is waxy; its odour is strong and unpleasant; its taste is bitter, acrid, nauseous, and persistent. M. Guibourt regards the masses as being made up of agglutinated tears, and on this account as being the purest met with. It is, however, frequently met with largely adulterated. In one sample weighing 10 ounces I obtained 10 drachms of stones and gravel. Notwithstanding occasional frauds of this kind, Smyrna opium forms the best commercial opium.

Smyrna opium yields more *morphia* and *meconic acid* than either Constantinople or Egyptian opium (Berthemot, *Journ. de Pharm.* xxiv. 444). The quantity of *morphia* which can be obtained from this kind of opium is perhaps, on the average, about eight per cent. Pelletier (*Journ. de Pharm.* xxi. 572), in an operation on about two ounces of this opium, procured a quantity of morphia equal to 7·08 per cent. From a pound he calculates eight or nine per cent. could be obtained. On an average, 12 per cent. of hydrochlorate of morphia may be procured from it. Dr. Christison obtained two drachms of *narcotine* from half a pound of the best Turkey opium: hence we may estimate the quantity at about four per cent. Hydrochlorate of morphia, prepared by Gregory's process from Turkey opium, contains, according to Dr. Gregory (*Journ. de Pharm.* xxi. 246), one-twelfth of codeia. Merck (*Pharm. Centr. Blatt. für* 1836, S. 491) examined five kinds of Smyrna opium: from the worst he procured from 3 to 4 per cent. of morphia; from the best 13 to 13·5 per cent. In the latter variety he found 0·25 per cent. of codeia.

2. *Constantinople Opium* (*Opium Byzantinum* seu *Constantinopolitanum*).—I am indebted to Professor Guibourt for an authentic sample of this. His description of it is as follows:—"There are two sorts of it: one in very voluminous irregular cakes, which are flattened like the Smyrna opium. This is of very good quality. The other is in small, flattened, regular cakes, of a lenticular form, from two to two and a half inches in diameter, and covered with a poppy leaf, the median nerves of which divide the disk into two parts. It has an odour similar to the preceding kind, but more feeble; it blackens and dries in the air. It is more mucilaginous than Smyrna opium." To this account I may add, that the cakes are never covered with the Rumex capsules, as those of Smyrna opium are. Berthemot describes two kinds of it: one soft, the other hard and brittle. Constantinople opium is inferior to the Smyrna kind, but superior to Egyptian opium.

Professor Guibourt says that this kind of opium yields only half the morphia procurable from the Smyrna opium. Berthemot also states that though it yields more morphia than the Egyptian opium, it gives less than the Smyrna kind. This, however, does not agree with the experience of Mr. Duncan, of Edinburgh, who has never failed to obtain an extraordinary quantity of hydrochlorate of morphia from it. From an experiment of Dr. Christison's, he calculates the quantity of hydrochlorate of morphia obtainable from it at 14 per cent. (*Journ. de Pharm.* xxi. 547). Merck (*Pharm. Centr.*

Blatt. für 1836. S. 491) procured 15 per cent. of pure morphia, but scarcely a trace o codeia. It is obvious, therefore, that Constantinople opium is of unequal quality. I is probable that opium of unequal qualities, and produced in several parts of th Turkish Empire, is carried to the capital, and, being exported from thence, bears th name of Constantinople opium.

3. *Egyptian Opium* (*Opium Egyptiacum*).—It occurs in round flattene cakes of about three inches diameter, covered externally with th vestiges of some leaf. It is usually very dry. It is distinguished from the two preceding varieties by its reddish colour, analogous to that o soccotrine or hepatic aloes. Some very inferior qualities are sometime offered for sale, and which appear to the sight and touch as if largel adulterated. By keeping it does not blacken like the other kinds; it odour is less strong and somewhat musty. Guibourt says, that by ex posure to the air it becomes soft. Egyptian opium is for the most part inferior to either of the preceding kinds; but its quality is by no means uniform. Some kinds become damp by keeping.

Guibourt tells us it yields only five-sevenths of the morphia obtained from Smyrna opium. Berthemot also states that it contains less morphia than either of the pre ceding kinds of opium, and that the morphia is more mixed with narcotine. He furthe adds, that the morphia which it yields is purified with great difficulty. The watery infusion of Egyptian opium has a distinct odour of acetic acid. Dr. Christison obtaine about $10\frac{1}{4}$ per cent. of pure white hydrochlorate of morphia from it, which, he says, i about the quantity procured from good Turkey opium. Merck (*op. supra cit.*) procure only from 6 to 7 per cent. of morphia, but much meconic acid.

4. *Trebizon Opium* (*Persian Opium*).—Some years since a quantity o opium was imported into this country from Trebizon, in the form o cylindrical sticks, which by pressure have become somewhat angular. Their length is about six inches; their diameter about half an inch, a little more or less. Each one is enveloped in a smooth shiny paper, and tied with cotton; its colour is similar to that of soccotrine aloes. It has the opiate odour stronger than that of the Egyptian kind, but less than Smyrna opium, and mixed somewhat with a musty odour; its taste is intensely bitter. It is commonly termed in commerce Persian opium, but the specimens I received came from Trebizon. It is a very inferio kind.

Merck (*Pharm. Centr.-Blatt. für* 1836, S. 493) could obtain no morphia from it by the ordinary mode of proceeding. He, however, afterwards succeeded in obtaining abou 1 per cent. It gave only a trace of narcotina. There must, I suspect, be some error in these statements, as this opium is certainly richer in morphia than is here stated.

5. *Indian Opium* (*Opium Indicum*).—Three varieties of Indian opium are known in commerce, viz.:—*Malwa*, *Benares*, and *Patna Opium*. As the two latter kinds are undistinguishable I shall include them unde one head of *Bengal Opium*.

a. Bengal Opium (*Benares* and *Patna Opium*).—A few chests of this kind have been recently imported. Its preparation is fully described by Dr. Butter (*On the Prepar. of Opium for the China Market;* in *Journ Asiat. Soc. of Beng.* v. 165, 1836). I have been kindly furnished with samples of the Benares and Patna kinds, of the growth of the years 1835-36, and 1837-38, by Mr. Maitland, of the India House.

Bengal opium is imported in balls, each weighing about three lbs. and a half, and packed in chests, each containing about forty balls. The balls are hard, round, like cannon-balls, and about the size of a child's head. Externally each ball is made up of poppy petals, firmly agglutinated by a paste called *lewa*, to form a firm but laminated envelope weighing about 14 oz. On cutting through this, the opium is found to be quite soft, homogeneous, apparently quite pure, and to have the consistence of a soft extract. Its colour is blackish-brown. Its odour and taste are strong and pure opiate. On exposure to the air this opium speedily becomes covered with mouldiness. Both *Bahar* or *Patna* and *Benares Opium* are exported from Calcutta. Bahar and Benares are the only districts of Bengal where opium is produced. Benares is most valued by the Chinese (Butter).

Further experiments are required ere we can speak with confidence as to the percentage quantity of morphia and narcotina obtainable from Bengal opium. Dr. Smytten (*Trans. of the Med. and Phys. Soc. of Calcutta*, vol. vi.) procured only $2\frac{1}{2}$ or 3 per cent. of morphia. But from some experiments which I have made, I consider this quantity to be considerably below the truth. Mr. Morson informs me that Benares opium contains rather more than half the quantity of morphia contained in good average Turkey opium.

β. *Malwa Opium.*—A few years since this ranked among the inferior kinds of Indian opium, but it has been gradually rising in value, and is now highly esteemed. I have received three samples of opium under this denomination. Two of these (which I shall call *inferior Malwa opium*) were brought me from India by old pupils. The third (*fine Malwa opium*) was kindly given me by Dr. Christison.

Inferior Malwa opium is in flattened cakes without any exterior covering. It is dull, opake, blackish-brown externally; internally somewhat darker and soft. Its odour is somewhat like that of Smyrna opium, but less powerful, and combined with a slight smoky smell.

Guibourt says it yields as much extract as Levant opium; but its insoluble residue wants the virous odour and glutinous consistence of the latter. It furnishes only one-third the quantity of morphia yielded by Smyrna opium.

Fine Malwa opium, given me by Dr. Christison, is in square cakes, about three inches in length and breadth, and one inch thick. It has the appearance, as Professor Guibourt describes it, of a well-prepared, shiny, dry, pharmaceutical extract. Its colour is blackish-brown. Its odour is less powerful than that of Smyrna opium.

This I presume is the opium employed by Merck (*Berl. Jahrb.* xxxvii. 289, 1837, and *Brit. Ann. of Med.* July 21, 1837) under the name of Bengal opium. In 100 parts he found *morphia* 8, *narcotin* 3, *codeia* 0·5, *thebaina* 1, *meconine* traces, and *porphyroxin* 0·5. Another sample of Indian opium, in round balls of half a pound each, and of the consistence of Calabrian extract of liquorice, yielded him 10 per cent. of morphia (*Pharm. Centr. Blatt. für* 1836, 493).

Dr. Christison procured $9\frac{1}{2}$ per cent. of hydrochlorate of morphia from this fine kind of Malwa opium. Dr. Smyttan, in two experiments, procured respectively $7\frac{3}{4}$ and 8 per cent. of morphia; whereas in common Malwa opium he obtained only from 3 to 5 per cent. The hydrochlorate of morphia, prepared by Gregory's process from this opium, contains, according to Dr. Gregory, one-tenth part of codeia.

γ. *Cutch Opium.*—Under this name I have received from Bombay a small cake of opium, rather more than an inch in diameter, and apparently enveloped with the remnants of leaves. Its odour is much less powerful than that of Smyrna opium.

6. *English Opium* (*Opium Anglicum*).—It is in flat cakes or balls, enveloped with leaves. It resembles fine Egyptian opium more than any other kind; its colour is that of hepatic aloes; it has a moderately strong

opiate odour. I must refer those interested in the cultivation of the poppy and production of British opium, to the papers of Mr. Ball, in *Trans. of Soc. of Arts*, xiv. 253; of Mr. Jones, *Ibid.* xviii. 161; of Mr. Young, *Ibid.* xxxvii. 23; of Messrs. Cowley and Staines, *Ibid.* xl. 9; and of the Rev. G. Swayne, *Quart. Journ.* vols. viii. and ix.

Mr. Hennell procured from 700 grains of English opium, prepared by Messrs. Cowley and Staines, 53 grains, or 7·57 per cent., of morphia; while from the same quantity of Turkey opium he obtained only 48 grains, or nearly 7 per cent., of morphia (*Trans. Soc. Arts*, xliii. 57). Mr. Morson (*Ibid.* l. 25), from 20 oz. avoird. of the same British opium, procured only 384 grains, or about 4·4 per cent. of morphia, and 22[illegible] grains, or about 2·53 per cent., of narcotina. Probably the morphia obtained by Mr. Hennell was not freed from narcotina. Mr. Young declares British opium to be stronger than the commercial opium; six ounces of the former being equal to eight of the latter (Duncan, *Suppl. to the Ed. Disp.* p. 81.)

7. *French Opium* (*Opium Gallicum*).—I have not seen any samples of this. Pelletier (*Journ. de Pharm.* xxi. 570) describes it as being deep reddish-brown, and brittle when dry. Its taste was somewhat different to that of Smyrna opium. It left a less insoluble residuum than Eastern opium.

Pelletier procured more *morphia* from it than from Smyrna opium. In an experiment on about two ounces of each he obtained 10·38 per cent. from the former, and only 7·0[illegible] per cent. from the latter. It contained no *narcotina*. He obtained sensible traces of *codeia*, but none of *narceine*, *meconine*, or *thebaina*, perhaps because the quantity of opium experimented on was too small. The disappearance of one immediate principle (narcotina), and the augmentation of another (morphia), caused by climate, are interesting facts. Petit (*Journ. de Pharm.* xiii. 183) got from 16 to 18 per cent. of morphia; and Caventou (quoted by Christison) obtained from 22 to 28 per cent. from French opium; but I presume the morphia was very impure.

8. *German Opium* (*Opium Germanicum*).—I am unacquainted with this.

Biltz, of Erfurt, got from indigenous German opium 16½ and even 20 per cent. of *morphia*, where the opium had been procured from the *P. somniferum α. nigrum*; and between 6¼ and 9½ *narcotina*. But from opium made from *P. somniferum β. album* he got conversely 6·8 per cent. of morphia, and 33 per cent. of narcotina.

Commerce of Opium.—The quantities of opium on which duty was paid during the last six years, are as follows (*Trade List*):—

In 1834	27,253 lbs.	In 1837	36,833 lbs.
1835	30,398	1838	30,824
1836	38,553	1839	40,784

Since August 13, 1836, the duty has been 1s. per lb.; previous to that and from 1828 it was 4s. per lb. Of the above quantities the greater part was imported from Turkey.

The quantity of opium produced in Hindostan is enormous. In Patna and Benares its cultivation is a monopoly in the hands of government; and a revenue is derived from the Malwa opium, by a system of passes on shipment from Bombay. Of the whole quantity raised in Hindostan, it is calculated that about two-thirds have been sent to Canton, and the remainder to the Eastern Islands (*Evid. taken before the Committee of the House of Lords on the Affairs of the East India Company*, No. 646, 1830, p. 25). The following table is from Mr. R. Montgomery Martin's *Statistics of the Colonies of the British Empire*, Lond. 1839 (p. 366).

Estimate of Quantity and Total Value of Indian Opium consumed in China during the Years ending in 1832-33:—

Years.	*Patna.*	*Benares.*	*Malwa.*	*Total.*	
	Chests.	Chests.	Chests.	Chests (of one pecul, or about $133\frac{1}{3}$ lbs. *avoird.*)	Amount in Spanish Dollars.
1827-28	4006	1128	4401	9535	10,425,075
1828-29	4831	1130	7171	13132	12,533,215
1829-30	5564	1579	6857	14000	12,057,157
1830-31	5085	1575	12100	18760	12,904,263
1831-32	4442	1518	8265	14225	11,501,584
1832-33	6410	1880	$15403\frac{1}{2}$	$23693\frac{1}{2}$	15,352,429

All the world knows that these enormous quantities of opium were smuggled into China (by the connivance of the local authorities) for the purpose of smoking. The vessels anchored at Lintin, about 70 miles from Canton, and delivered the opium to the boats of the Chinese buyers. "Malwa opium is considered by the Chinese as having a higher touch, but not so mellow nor so pleasant in flavour as the Patna opium. The smokeable extract which each quantity of opium contains is thus intimated by the Chinese,— (who use opium as we do wine or spirits):—Patna and Benares opium 45 to 50 touch; average 48; Malwa 70 to 75; average $72\frac{1}{2}$; Turkey 53 to 57; average touch 55." (R. M. Martin, *op. supra cit.* p. 366). The *smokeable extract* here referred to is an aqueous extract of opium prepared by the Chinese. A detail of the important events which have resulted from the active and extraordinary steps taken by this remarkable people to put a stop to the trade in opium, would be out of place in this work. Suffice it to say, that, in 1839, no less than 20,283 chests of opium, valued at nearly 3,000,000*l.* sterling, were delivered up to the Chinese, and by them destroyed by immersing the opium in water with lime and salt, and, when the whole had become a fetid mud, allowing it to escape into the river (see *Asiatic Journal*, vol. xxx. part ii. p. 310). Also *Parl. Rep. on the Trade with China*, No. 359, 1840; and *Corresp. relating to China*, 1840).

Composition.—Few substances have been so repeatedly submitted to chemical investigation as opium. The mere reference to the different labours, which have been bestowed on it, would occupy more space than I can devote to the subject. I must, therefore, content myself with brief notices of the most important epochs in its chemical history, and a reference to some of the analyses which have been made of it.

In 1803 Derosne (*Ann. de Chim.* xlv. 257) discovered *narcotina.* In 1804 Sertürner (*Trommsdorf's Journ.* 1805, Bd. xiv. 1, S. 47) announced the existence of *meconic acid* and *morphia.* Seguin (*Ann. de Chim.* xcii. 225; and *Ann. de Chim. et Phys.* ix. 282) appears to have discovered them about the same time. Robiquet (*Ibid.* v. 275) confirmed these discoveries in 1814. In 1826 *meconine* was discovered by Dublanc jeune, and again in 1830 by Couerbe (*Ibid.* l. 337). In 1832 Pelletier (*Ibid.* l. 262) discovered *narceina:* and in the same year Robiquet (*Ibid.* li. 259) announced the existence of *codeia.* In 1837 Merck (*Pharm. Central.-Blatt. für* 1837, S. 342) announced the existence in opium of a new substance which he called *porphyroxin,* but his statement requires confirmation.

Analyses of opium have been published, in 1800, by Bucholz (*Trommsdorf's Journ.* viii. S. 24), in 1804 by Sertürner, in 1814 by Seguin, in 1817 by Braconnot (*Journ. de Phys.* lxxxiv. 225), in 1818 by Buchner (quoted by Schwartze, *Pharm. Tab.*), in 1819 by John (Gmelin, *Handb. d. Chem.* ii. 1244), in 1823 by Pfendler (*Chem. Abhandl. ü. d. Opium.* Wien 1823), in 1824 by Lindbergson (Gmelin, *op. supra cit.*), in 1826 by Merck (*Ibid.*), in 1826 by Geiger (*Ibid.*), in 1831 by Biltz

(*Pharm. Centr.-Blatt. für* 1837, S. 757), in 1832 by Pelletier (*Ann. de Chim. et de Phys.* l. 240), in 1834 by Schindler (*Pharm. Centr-Blatt. für* 1834, S. 950), and in 1836 by Mulder (*Ibid. für* 1837, S. 574).

The following substances may be regarded as the constituents of opium:—*Morphia, narcotina, codeia, narceia, meconine, thebaina or paramorphia, pseudo-morphia ?, meconic acid, brown acid extractive, sulphuric acid, resin, fat oil, gummy matter, caoutchouc, albumen, odorous principle* (volatile oil ?), and *lignin*.

Mulder's Analyses.	*Smyrna Opium.* 1	2	3	4	5
1. Morphia	10·842	4·106	9·852	2·842	3·800
2. Narcotina	6·808	8·150	9·360	7·702	6·546
3. Codeia	0·678	0·834	0·848	0·858	0·620
4. Narceine	6·662	7·506	7·684	9·902	13·240
5. Meconine	0·804	0·846	0·314	0·380	0·608
6. Meconic acid	5·124	3·968	7·620	7·252	6·644
7. Fat	2·166	1·350	1·816	4·204	1·508
8. Caoutchouc	6·012	5·026	3·674	3·754	3·206
9. Resin	3·582	2·028	4·112	2·208	1·834
10. Gummy extractive	25·200	31·470	21·834	22·606	25·740
11. Gum	1·042	2·896	0·698	2·998	0·896
12. Mucus	19·086	17·098	21·068	18·496	18·022
13. Water	9·846	12·226	11·422	13·044	14·002
Loss	2·148	2·496	0·568	2·754	3·332
Smyrna Opium	100·000	100·000	100·870	99·000	99·998

Schindler's Analyses.

	Smyrna Opium.	*Constantinople Opium.*	*Egyptian Opium.*
Morphia	10·30	4·50	7·00
Narcotina	1·30	3·47	2·68
Codeia	0·25	0·52	
Narceine	0·71	0·42	
Meconine	0·08	0·30	
Meconic acid	4·70	4·38	
Resin	10·93	8·10	
Bassorin, caoutchouc, fat, and lignin	26·25	17·18	
Salts and volatile oil	3·60	3·60	
Lime and magnesia	0·47	0·42	[90·32]
Alumina, oxide of iron, silica, and phosphate of lime	0·24	0·22	
Brown acid, soluble in alcohol and water	1·04	0·40	
Brown acid, soluble in water; gum, and loss	40·13	56·49	
Total	100·00	100·00	100·00

Biltz's Analyses.

	Oriental Opium.	*Indigenous Opium.* From α, *nigrum.*	From β, *album*
Morphia	9·25	20·00	6·85
Narcotina	7·50	6·25	33·00
Meconic acid (impure)	13·75	18·00	15·30
Bitter extractive	22·00	8·50	11·00
Deposit	7·75	4·75	2·20
Albumen	20·00	17·50	13·00
Balsamic matter	6·25	7·65	6·80
Caoutchouc	2·00	10·50	4·50
Gum with lime	1·25	0·85	1·10
Sulphate of potash	2·00	2·25	2·00
Lime, iron, alumina, and phosphoric acid	1·50	1·85	1·15
Woody fibre	3·75	0·80	1·50
Ammonic volatile oil, and loss	3·00	1·10	1·60
Total	100·00	100·00	100·00

1. *Volatile Odorous Principle* (*Volatile Oil?*). The distilled water of opium has the peculiar odour of this drug, and by keeping deposits a ropy substance. Hitherto, however, all attempts to isolate the volatile odorous principle of opium have failed, and its nature, therefore, is as yet unknown. Nysten (Orfila, *Toxicol. Gén.*) swallowed two ounces of the distilled water without any sensible effect; and Orfila injected a like quantity of it into the jugular vein of a dog without apparently causing any inconvenience to the animal. The volatile principle cannot, therefore, possess much activity; but Nysten concludes that "the distilled water of opium, strongly saturated with the aromatic principle, is capable of producing drunkenness and sleep, when taken in strong dose."

2. Morphia (*Morphina; Morphine; Morphium*). So called from *Morpheus*, the god of sleep. Wedelius, Fr. Hoffman, and Neumann, speak of a *crystalline salt* obtained from a solution of opium; but they formed no correct notions of its nature. The *magistery of opium*, noticed by Ludwig, in 1688, may, perhaps, have been morphia.

Morphia is peculiar to the poppy tribe. It exists in opium in combination with meconic and sulphuric acids. Doubts, indeed, have been expressed with respect to its existence in opium, some chemists having suggested that it was a *product* rather than *educt*; but the accuracy of these views has been satisfactorily disproved.

Pure morphia presents itself under the form of transparent crystals, whose primary form is the right rhombic prism. On turmeric paper, as well as on reddened litmus paper, morphia has an alkaline reaction. Notwithstanding that it is insoluble, or nearly so, in cold water, it has a distinctly bitter taste. Boiling water dissolves a little more than one-hundredth part of its weight of morphia. It dissolves in 40 parts of cold anhydrous alcohol, and in 30 parts of boiling alcohol; but it is insoluble, or nearly so, in ether. It is soluble in the oils (fixed and volatile), in solutions of potash and soda, and also, but in much smaller quantity, in solution of ammonia: lastly, it readily dissolves in sulphuric, hydrochloric, and acetic acids. When heated, the crystals lose their transparency and water of crystallization; a strong heat causes them to enter into fusion, in which state they form a yellow liquid similar to melted sulphur, and which becomes white and crystalline on cooling. Heated in the open air, it burns like resin, and leaves a carbonaceous residuum.

The following are the chief *characteristics* of morphia:—

1st. *Nitric acid* reddens morphia or its salts (the chlorate excepted, according to Dumas), and forms with them an orange-red solution, which is much darkened by excess of ammonia, and which becomes yellow after a little time. By the prolonged digestion of morphia in nitric acid, we obtain oxalic acid.—*Fallacies.* Nitric acid produces a red colour with several other bodies, as brucia, commercial strychnia, several volatile oils (as oil of pimento and oil of cloves), some resinous substances, infusion of cloves or of pimento, &c.

2nd. *Iodic acid* is deoxidized by morphia, iodine being set free. Hence, when this alkali is added to a solution of iodic acid, the liquor becomes reddish brown, and forms a blue compound (*iodide of starch*) with starch.—*Fallacies.* Sulphuretted hydrogen, sulphurous acid, phosphorous acids, and some other agents, have a similar effect on iodic acid.

3rdly. *Sesquichloride of iron* dropped on crystals of morphia renders them blue. The same effect is produced on the acetate and oxalate, and slightly on the sulphate of morphia. No obvious effect is produced on the hydrochlorate of morphia until an alkali is added. The nature of the blue compound is not completely understood. Possibly, part of the morphia is oxidized, and the compound thus produced unites with some oxide of iron (*morphite of iron*). If water in excess, or acids, or alkalies, be added to the blue compound, the colour is destroyed.—*Fallacies.* Tannic and gallic acids with a little water, and infusion of cloves or of pimento, also form blue compounds with sesquichloride of iron.

4thly. The *alkaline carbonates* occasion a white precipitate (*carbonate of morphia*) in solutions of the soluble morphitic salts.

5thly. *Solution of ammonia* precipitates morphia from its solution in acids. A considerable excess of ammonia redissolves the precipitate. In very dilute solutions, ammonia occasions no precipitate until heat be applied to drive off the excess of alkali.

6thly. *Infusion of nutgalls*, or a *solution of tannic acid*, causes a precipitate (*tannate of morphia*) in neutral solutions of the morphitic salts. The precipitate is soluble in acetic acid.

7thly. An alcoholic solution of *carbazotic acid* causes no precipitate in an alcoholic solution of morphia.

8thly. If a solution of *chlorine* be mixed with a solution of morphia, or its salts, and then ammonia added, a dark brown colour is developed.

The *composition* of morphia is as follows:—

	Atoms.	*Eq. Wt.*	*Per cent.*
Carbon	35	210	71·91
Hydrogen	20	20	6·85
Nitrogen	1	14	4·80
Oxygen	6	48	16·44
Morphia	1	292	100·00

	Atoms.	*Eq. Wt.*	*Per cent.*
Morphia	1	292	94·2
Water	2	18	5·8
Cryst. Morphia	1	310	100·00

The *morphitic salts* are, for the most part, crystallizable. When pure, they are colourless. They have a bitter taste. Those of them which are employed in medicine will be described hereafter.

3. Codeia (*Codeine*).—So called from *κώδεια, a poppy head.* It is a white, crystalline solid, slightly soluble in cold, and still more so in boiling water. It is soluble in ether. It is insoluble in a cold weak solution of potash. If more codeia be added to boiling water than this liquid can dissolve, the excess melts and forms an oily layer at the bottom of the vessel; and, by cooling, a crystalline mass is obtained. It reacts as an alkali on test papers, and unites with acids to form crystalline salts.

From morphia, codeia is distinguished by its not becoming blue on the addition of sesquichloride of iron. It is also said not to redden nitric acid like morphia. All the specimens of codeia which I have met with became orange-yellow on the addition of nitric acid. Moreover, ammonia does not precipitate it from its very diluted solution in hydrochloric acid, on account of its solubility in water; and this affords a means of separating morphia from codeia. The separation may be more easily effected by ether, which readily dissolves codeia; or by alkalies, (potash or soda,) which dissolve morphia, but leave codeia. From meconine it is distinguished by its aqueous solution possessing marked alkaline properties, as manifested by its action on test papers. Tincture of nutgalls produces a copious precipitate (*tannate of codeia*) in solutions of codeia.

Anhydrous codeia consists of $C^{35}\ H^{20}\ N^{1}\ O^{5}$. It, therefore, contains an atom less of oxygen than morphia does. Its atomic weight is 284.

Crystallized in ether it contains no water. But crystallized in water it retains two atoms of water of crystallization.

The *salts of codeia* have not been much studied. The *nitrate* readily crystallizes. The *tannate* is insoluble in water. The *double hydrochlorate of morphia and codeia* is the salt at one time sold as hydrochlorate of morphia, by those who prepared it by Gregory's process. Hence it has been termed by the French pharmacologists *sel de Gregory.*

The *effects* of codeia and its salts have been imperfectly examined by Kunkel, Gregory, Barbier, and Magendie; but the results are very contradictory. Kunkel (*Journ. de Chim.-Méd.* ix. 223) says it is a local irritant, becomes absorbed, excites the circulation, and produces convulsions; but that none of the animals on which the codeia was tried were either stupified or paralyzed. Magendie (*Formulaire*, 87, 8me éd.), however, says it causes sleep, and, when exhibited in large doses, stupor. He considers one grain of codeia equivalent to half a grain of morphia: two grains excite nausea and vomiting. Barbier (*Journ. de Chim.-Méd.* x. 214, & 337) also states it produces sleep. Dr. W. Gregory (*Ibid.* p. 219) says that, in doses of five or six grains, it causes an excitement like that of intoxication, followed in a few hours by depression, nausea, and sometimes vomiting.

Magendie proposes to use it as a substitute for morphia, to procure sleep and allay pain, in doses of from one to three grains. A *syrup of codeia* (composed of codeia, grs. xxiv.; distilled water, f℥iv.; sugar, ℥viij.) has been used in hooping-cough. The dose for a child, of about seven years of age, is a tea-spoonful. It has been given in irritation of the gastric mucous membrane (*Journ. de Pharm.* xxiv. 144.)

4. Narcotina (*Narcotine*).—So called from *ναρκωτικὸς, narcotic.* The greater part of the narcotina of opium is in the free state, as it is removable by ether without the aid of either acids or alkalies. It is a white, inodorous substance, crystallising in prisms,—distinguished from morphia by being insipid, very soluble in ether, insoluble in alkalies, by its not becoming blue on the addition of the sesquichloride of iron, by its not decomposing iodic acid, and, when quite pure, by its not yielding a brown colour when treated by chlorine and ammonia. Nitric acid dissolves it, and acquires an orange tint. It does not affect vegetable colours, and by this character is readily distinguished from both morphia and codeia. It is insoluble in cold water, but dissolves in 400 parts of boiling water,—in 100 parts of cold alcohol,—or in 24 parts of boiling alcohol. The volatile oils also dissolve it. It consists of $C^{48}\ H^{24}\ N\ O^{15}$. Its atomic weight, therefore, is 446. The *salts of narcotina* have been but little examined. They are more bitter than those of morphia, redden litmus, and are precipitated from their solutions by infusion of nutgalls and by the alkalies. The *hydrochlorate* is crystallizable. Both this and the *sulphate* are very soluble in water.

Narcotina is extracted from the residue of the opium which has been subjected to the action of cold water. This is treated with water acidulated with either acetic or hydrochloric acid, and to the filtered solution ammonia is added. The precipitate treated with boiling alcohol yields narcotina, which deposits as the liquor cools. Narcotina may be separated from morphia, by ether, which dissolves the narcotina, but leaves the morphia, or by a solution of potash, which dissolves the morphia, but leaves the narcotina, or by the cautious addition of weak acetic acid, which dissolves the morphia, and, unless the acid be greatly in excess, does not dissolve the narcotina.

When narcotina was first discovered, it was said to be the stimulant principle of opium; and Magendie states a grain of it, dissolved in olive oil, produced the death of a dog in twenty-four hours, while twenty-four times this quantity was given, dissolved in acetic acid, with impunity. Orfila, at one time, declared it was inert, then that it acted like morphia, and subsequently that its operation was remarkable and peculiar. Bally asserts that, in a solid state, it is inert; for 129 grains may be given, at one dose, without exciting any obvious effect. The truth is, I believe, that narcotina possesses but little activity; and I presume, therefore, that the first experimenters with it employed an impure substance. Dr. Roots gave gradually increased doses of it, up to a scruple, without the least injury. The bitterness of its sulphuric solution led him to employ it in intermittents, as a substitute for disulphate of quina. More recently attention has been drawn to it in India, by Dr. O'Shaughnessy (*Brit. and For. Med. Rev.* vol. viii. p. 263), as an Indian indigenous substitute for quina; and nearly 200 cases of intermittent and remittent fevers, treated by it with success, have been published.

5. NARCEINE (*Narceina*).—So called from *νάρκη, stupor*. It is a white, inodorous solid, crystallized in long, fine, silky needles, with a slightly bitter, and even somewhat metallic, taste. It dissolves in 230 parts of boiling water, or 375 parts of water at 60°. It fuses at about 198°, and at a higher temperature is decomposed.

Narceine has several very striking properties by which it is distinguished from other substances. The first of these deserving of notice is the action of mineral acids on it. Thus the sulphuric, nitric, and muriatic acids, so diluted with water that they cannot alter the elementary composition of narceine, give this substance a fine light-blue colour, immediately on coming in contact with it. This alteration of colour does not appear to depend on any change in the elementary composition of narceine, since, by saturating the acids with ammonia, the narceine is precipitated unchanged. When much water is added, the blue colour disappears.

Another remarkable trait of narceine is, that it forms a bluish compound (*iodide of narceine*) with iodine: heat and alkalies destroy the colour. So that iodine is not an absolute test for starch.

The characters now mentioned are sufficient to distinguish narceine from all other known substances. In addition, I may add, that it does not form a blue colour with the sesquichloride of iron, as morphia does.

Narceine was at first supposed to be a vegetable alkali; but as it does not affect vegetable colours, nor combine with nor saturate acids, it is now regarded as a neutral principle. Narceine is composed of $C^{28}\ H^{20}\ N\ O^{12}$.

Two grains have been several times thrown into the jugular vein of a dog, without producing any appreciable effect. It is presumed, therefore, to be inert.

6. MECONINE.—So called from *μήκων, a poppy*. It is a white, crystalline, odourless solid. Its taste, which at first is scarcely perceptible, is afterwards sensibly acrid. The crystals are six-sided prisms, with dihedral summits. It fuses at 194°, and becomes a colourless, limpid fluid. At a higher temperature it may be distilled. It dissolves in 265 parts of cold water, or in eighteen parts of boiling water. It is soluble in alcohol and in ether. It is distinguished from morphia and codeia by its not possessing alkaline properties. From morphia it is further distinguished by its greater fusibility, its greater solubility in water, and its not becoming blue on the addition of sesquichloride of iron. Cold sulphuric acid dissolves meconine, the solution being limpid and colourless. If heat be applied, the liquid becomes dark. If the quantity of sulphuric acid be small in proportion to that of meconine, the liquid assumes a green colour. If chlorine gas be passed over fused meconine, the latter becomes blood-red, and on cooling forms crystals. The compound thus formed is composed of chlorine and some organic base: if the first be removed by oxide of silver, a white acid is obtained, which Couerbe calls *mechloic acid* ($C^{14}\ H^7\ O^{10}$). By the action of nitric acid on meconine we obtain *hyponitromeconic acid*, composed of one atom of meconine and half an atom of hyponitrous acid. Meconine is remarkable for not containing nitrogen. Its composition is $C^{10}\ H_5\ O^4$.

A grain dissolved in water, and injected into the jugular vein of a dog, produced no remarkable effect. Further experiments, however, are required before we can positively declare it to be an inert substance.

7. THEBAINA (*Paramorphia*).—So called from *Thebes*, an ancient city of Egypt. It is a white, crystalline, fusible solid, having an acrid, styptic taste, very soluble in alcohol and ether, but hardly at all soluble in water. It possesses alkaline properties, and dissolves in weak acids. From these solutions it is precipitated by alkalies. An excess of alkali cannot dissolve it, unless, indeed, the alkaline solution be very concen-

trated. It fuses at 302°, but does not volatilize at any temperature. It is distinguished from morphia by not becoming blue on the addition of the perchloride of iron, and by not forming crystallizable salts with acids. From codeia it differs in not crystallizing in large crystals, and in not forming crystallizable salts. With meconine and narceine it has no analogy, and from them it is distinguished by the peculiar properties which characterize these bodies. It resembles narcotina more than any other substance, but is distinguished by the crystals being shorter or granular, and wanting the pearly brilliance possessed by those of narcotina; by its acrid taste; by its fusibility at 302°; by its greater solubility in alcohol; and by nitric acid when dropped on it converting it into a substance like a soft resin, before dissolving it. Pelletier considered it isomeric with morphia;—hence he called it paramorphia. According to Dr. Kane's analysis it consists of $C^{25} H^{14} N O_3$; and its atomic weight is 202. Couerbe's analysis gives another atom of oxygen. The last-mentioned chemist says that, by fusion, the crystals lose two atoms of water. Magendie says that one grain injected into the jugular vein, or placed in the pleura, acts like brucia or strychnia, and causes tetanus and death in a few minutes.

8. Pseudomorphia.—This is a substance which Pelletier has occasionally met with in opium. It is a whitish solid, which, like morphia, dissolves in caustic alkalies, is reddened by nitric acid, and made blue by contact with the sesquichloride of iron. But it does not decompose iodic acid, and cannot form salts with acids. It consists of $C^{27} H^{18} N O^{14}$. It is not poisonous; at least, nearly eight grains, given to a rabbit, produced no effect. Pelletier thinks that pseudomorphia must be some combination of morphia, in which this substance has lost its poisonous properties.

9. Porphyroxin?—This name has been given by Merck (*Pharm. Central-Blatt für* 1837, S. 342; and *Brit. Ann. of Med.* ii. 82) to a supposed new principle found in Bengal opium. It is described as crystallizable, fusible, soluble in alcohol, ether, and weak acids. Alkalies precipitate it from its acid solution. Further experiments are required to determine its existence and precise nature.

10. Resin.—Brown, insipid, inodorous, softened by heat, insoluble in water and ether, but soluble in alcohol and in alkaline leys. Nitrogen is a constituent of it.

11. Extractive.—The substance usually denominated the extractive of opium is probably a heterogeneous body. It is brown and acid; and has been supposed to be one of the active principles of opium. The reasons for this opinion are the following:—In the *first* place, it is asserted that after the morphia has been separated from an infusion of opium by magnesia, the filtered liquor gives by evaporation an extract which produces the same kind of narcotic effect that opium does (Berzelius, *Traité de Chim.* t. v. p. 136; and t. vi. p. 152). *Secondly*, the effects of the known active principles of opium are not sufficiently powerful to authorize us to refer the whole of the active properties of opium to them. Thus on an average 100 parts of opium yield from 8 to 10 parts of morphia (the most active of the known constituents of opium), and, therefore, if this alkali were the only active principle, it ought to be 10 or 12 times as powerful as opium is. Now we know that morphia is but little, if at all, more active than opium; and, therefore, this last-mentioned substance either contains some other active principle, or the activity of morphia is surprisingly increased by the principle or principles with which it is naturally in combination. Butter (*op. supra cit.*) says the insoluble residuum possesses considerably narcotic qualities.

12. Fatty Matter.—Yellow or brownish. Probably colourless when pure. It reddens litmus, and unites with alkalies to form soaps, from which acids disengage it apparently unchanged.

13. Meconic Acid.—Hitherto found in the poppy tribe only. It is usually procured from meconate of lime by acting on it, in hot water, with hydrochloric acid. The meconic acid crystallizes on cooling. When pure it is in the form of white, transparent, micaceous scales, which are soluble in four times their weight of boiling water. But at this temperature water decomposes it; carbonic acid is evolved, and a solution of *metameconic acid* ($C^{12} H^4 O^{10}$) is obtained. Cold water dissolves a smaller quantity of meconic acid. Alcohol is also a solvent for meconic acid. By the dry distillation of meconic acid, it loses carbonic acid and water, and becomes *pyromeconic acid* ($C^{10} H^3 O^5$). The composition of meconic acid is $C^7 H^2 O^7$; and its atomic weight, therefore, is 100.

The *characteristics* of meconic acid are as follows:—1st. *It reddens the sesquisalts of iron*, forming the *meconate of the sesquioxide of iron*. Alkalies, protochloride of tin, and nitric acid, assisted by heat, destroy this red colour. 2ndly. It forms, with a weak solution of *ammoniated sulphate of copper*, a green precipitate (*meconate of copper*). 3rdly. It yields white precipitates (*meconates*) which are soluble in nitric acid, with *acetate of lead, nitrate of silver*, and *chloride of barium*. 4thly. It is not reddened by *chloride of gold*.

TABULAR VIEW OF THE PRINCIPAL CHARACTERS OF THE CRYSTALLINE PRINCIPLES OF OPIUM.

Characters.	Morphia.	Pseudo-Morphia.	Codeia.	Narcotina.	Thebaina.	Narceine.	Meconine.
Taste	Very bitter	... ? ...	Bitter	Insipid; the salts bitter	Rather acrid and metallic	Slightly bitter ...	Rather acrid.
Fusibility	Fusible	Infusible ?	Fusible at 302° ...	Fusible at 338°	Fusible at 266°	Fusible at 198°	Fusible at 194°.
Ditto in Boiling Water	Infusible	Infusible	Fusible	... ...	... ...	Fusible	Fusible.
Solubility in *Cold Water*	Insoluble, or nearly so ...	Almost insoluble	Soluble in 80 pts	Insoluble	Very slightly soluble	Soluble in 375 pts	Soluble in 266 pts
Solubility in *Boiling Water*	Soluble in 100 pts		Soluble in 17 pts	Very slightly soluble		Soluble in 230 pts	Soluble in 19 pts
Solubility in *Cold Alcohol*	Soluble in 40 pts	Less soluble than in water	Very soluble ...	Soluble in 100 parts	Soluble in 10 pts	Soluble	Soluble.
Solubility in *Boiling Alcohol*	Ditto in 30 parts				Still more soluble	More soluble ...	Soluble.
Solubility in *Cold Ether*	Scarcely soluble			Readily soluble	Very soluble	Insoluble	Soluble.
Solubility in *Potash* or *Soda Ley*	Soluble	Soluble	Insoluble in the cold ley	Insoluble, or nearly so ...	Insoluble, unless the ley be very concentrated	... ...	Soluble.
Basic quality *Action on Test paper*	Alkaline	... ? ...	Alkaline	Neutral	Alkaline	Neutral	Neutral.
Basic quality *Salifiability*	Salifiable	Not salifiable ...	Salifiable	Salifiable	Salifiable ?	Not salifiable ...	Not salifiable.
Action of Nitric Acid	Reddened: solution red ...	Reddened	Solution not red	Made yellow: solution yellow	Gives it a resinous appearance, and dissolves it	Coloured blue by dilute acid	Solution yellow.
Coloured blue by Hydroch. Acid	... Not ...	... Not ...	... Not ...	... Not ...	... Not ...	Coloured blue ...	... Not.
Ditto by Sesquichloride of Iron	Coloured blue ...	Coloured blue ...	... Not ...	... Not ...	... Not ...	... Not ...	... Not.
Coloured blue by Iodine	... Not ...	... ? ...	... Not ...	... Not ...	... Not ...	Coloured blue ...	... Not.
Decomposes Iodic Acid	Decomposes Iodic acid ...	... ? ...	... Not ...	... Not ...	... Not ...	... Not ...	... Not.
Precipitated by Infusion of Nutgalls	Precipitated	... ? ...	Precipitated	Precipitated	... ? ...	... ? ...	... ?
When fused reddened by Chl. Gas	... Not ...	... ? ...	... Not ...	... Not ...	... Not ...	... Not ...	Blood-red.
Composition	$C^{35} H^{20} N^{1} O^{6}$	$C^{27} H^{18} N^{1} O^{14}$	$C^{35} H^{20} N^{1} O^{5}$	$C^{48} H^{24} N^{1} O^{15}$	$C^{25} H^{14} N^{1} O^{3}$	$C^{28} H^{20} N^{1} O^{12}$	$C^{10} H^{5} O^{4}$
Equivalent	... 292 ...	... 306 ...	... 284 ...	... 446 ...	... 202 ...	... 298 ...	97 (?).
Water of Crystallization	2 atoms	... ? ...	2 atoms	3 or 4 per cent.	1 atom	... ? ...	None.
Poisonous	Poisonous	Not poisonous ...	Poisonous	Inert ?	Poisonous	Inert ?	Inert ?

*** I have had no opportunity of verifying the statements in this column. [Pseudo-Morphia]

It deserves especial notice that many substances enjoy equally with meconic acid the power of communicating a red colour to the sesquisalts of iron. The following are some of them:—the *acetates*, *hydrosulphocyanic acid*, and the *sulphocyanides*, the *saliva of man* and *of the sheep*, *infusion of white mustard*, *metameconic*, *pyromeconic*, and *indigotic acids*, the liquid obtained by the action of hydrochloric acid on detonating silver, the decoctions of *Cetraria islandica* (p. 568) and *Gigartina Helminthocorton* (p. 565).

Meconic acid is an inert substance. Sertürner swallowed five grains of it without observing any effect. Sömmering gave ten grains to a dog; Feneglio and Blengini eight grains to dogs, crows, and frogs, and four grains to various men: in all cases no effects were observed (Richter, *Ausf. Arzneim.* Bd. ii. S. 616). Combined with bases, it doubtless modifies their action. Meconate of soda, however, is not active, as Sertürner asserted. It is supposed that the effect of the morphia on opium is modified by its combination with meconic acid. I have already mentioned that this acid is said to be an antidote in cases of poisoning by bichloride of mercury (see p. 479). If, however, the statement be true, the fact is of little practical value, on account of the scarcity of the acid; for neither opium nor laudanum can be given in quantity sufficient to neutralize the effect of this salt, without proving deleterious. Moreover, we have other good and easily accessible antidotes. Anthelmintic properties have been ascribed to the acid and some of its salts.

CHEMICAL CHARACTERISTICS.—Litmus paper is reddened by a watery infusion of opium (or tincture of opium diluted with water), owing to a free acid (*meconic*). Sesquichloride of iron gives it a deep red colour (*meconate of iron*). Acetate and diacetate of lead occasion a copious grey precipitate (*meconate and sulphate of lead, with colouring matter*), which, treated by sulphuric acid or sulphuretted hydrogen, yields free meconic acid, known by its reddening the persalts of iron. Chloride of barium also causes a precipitate (*meconate and sulphate of baryta*). Ammonia renders the infusion turbid (*precipitated morphia and narcotina*). Tincture of nutgalls causes a precipitate (*tannates of morphia* and *codeia*). Nitric acid communicates to the infusion a red colour (*oxidized? morphia*). Iodic acid and starch cause, after some hours, a blue precipitate (*iodide of starch*). This last test does not always succeed. Chloride of gold causes a deep fawn-coloured precipitate.

APPLICATION TO MEDICO-LEGAL PURPOSES.—On examining the alimentary canal of persons destroyed by opium, it not unfrequently happens that no traces of the poison can be obtained. I have met with several instances of this, and others are referred to by Dr. Christison (*On Poisons*). Either, therefore, opium is rapidly absorbed, and its unassimilated parts thrown out of the system by the excretories, or the constituents of this substance are digestible and assimilable.

The characters available for the detection of opium are two-fold,—*physical* and *chemical*.

1. *PHYSICAL CHARACTERISTICS.*—Whether in the solid state or dissolved in water or spirit, opium possesses three physical properties, by one or more of which it may be frequently recognized. These are, *a more or less brown colour*, *a remarkable and peculiar odour*, and *a bitter taste*. Of these the odour is the only characteristic one. In the alimentary canal it is strongest when the stomach is just opened, or when the opiate liquor is just reaching the boiling point. Other odours, however, frequently mask it. The analogy between the odours of lactucarium and opium deserves notice.

2. *CHEMICAL CHARACTERISTICS.*—The chemical tests of opium are those for meconic acid and morphia, above mentioned. In a case of suspected poisoning, the stomach and duodenum (cut into small pieces), with their contents, are to be digested in distilled water, and the solution filtered successively through a sieve, muslin, and paper. A little acetic acid added to the water coagulates any caseum, and is thought to facilitate the solution of the morphia. Its presence is objectionable, on account of the red colour produced by the action of the acetates on the ferruginous salts, and which simulates that developed with these salts by meconic acid.

(*a.*) *Application of trial tests.*—To a small portion of the filtered liquid apply the following tests:—

1. A few drops of *tincture of chloride of iron*, which produces a red colour (*meconate of iron*) in an opiate solution.—The *fallacies* of this test have been before stated.

2. Apply excess of *strong nitric acid*, which also reddens (*oxidizes? morphia*) opiate liquors.—The *fallacies* of this have also been pointed out.

3. Add *iodic acid* and *starch*, and set aside for twenty-four hours. Blue iodide of starch is sometimes formed if morphia be present (unless, indeed, the quantity be very minute).—The *fallacies* of this have likewise been stated.

The success or failure of these tests is not to be considered as absolutely decisive as to the presence or absence of opium.

6. *Separation of the Morphia and Meconic Acid.*—Add to the filtered liquor a considerable excess of a solution of acetate of lead, and set aside in a tall vessel for the precipitate (*meconate and sulphate of lead, with colouring matter*) to subside, leaving a clear liquor (*acetates of morphia and lead, &c.*) Pour off the latter, and collect the precipitate on a filter.

Before adding the acetate of lead, it may be sometimes necessary to evaporate the liquor, in a water-bath, to the consistence of syrup, which is to be digested and boiled in alcohol, and the alcoholic tincture evaporated, and the residuum dissolved in water. To the filtered solution add the acetate of lead. This complication of the process is not usually necessary. Furthermore, by boiling with water, meconic acid is decomposed.

The above-mentioned clear liquor and the lead precipitate are then to be tested (the first for morphia, the second for meconic acid), as follows:—

1. *Proceeding with the lead precipitate* (meconate and sulphate of lead, and colouring matter).

Suspend the lead precipitate in water contained in a conical glass (see fig. 60, p. 380), and pass a stream of sulphuretted hydrogen through it, to convert the lead into a sulphuret, which is to be removed by filtration. The clear liquor is then to be gently heated (to expel the excess of sulphuretted hydrogen), and, if necessary, concentrated by evaporation. Boiling decomposes the meconic acid. The tests for meconic acid (p. 1284) are then to be applied, viz.:—

a, Tincture of chloride of iron.
b, Ammoniacal sulphate of copper.
c, Chloride of gold.
d, Acetate of lead.

2. *Proceeding with the clear liquor* (solution of the acetates of morphia and lead).

Place the clear liquor in a conical glass (see fig. 60, p. 380), and pass through it a stream of sulphuretted hydrogen, to precipitate the lead, and then filter. Then boil the filtered liquor, and, if necessary, concentrate by evaporation. To the clear liquor apply the before-mentioned tests for morphia (see p. 1281), viz.:—

a, Strong nitric acid in excess.
b, Iodic acid and starch (several hours may be necessary for the success of this test).
c, Tincture of chloride of iron (this test will only succeed with solid morphia, or very concentrated solutions).
d, Ammonia.
e, Infusion of nutgalls (this test will not answer if much free acid be in the liquor).
f, Chlorine, and afterwards ammonia.

Instead of sulphuretted hydrogen, directed to be used in the above proceedings, it may be sometimes more convenient to employ a few drops of diluted sulphuric acid, which converts the lead into an insoluble sulphate.

Dr. Christison observes, that "it will often happen, in actual practice, that the only indication of opium to be procured by the process consists in the deep red colour struck by permuriate of iron with the meconic acid. Now, will this alone constitute sufficient proof of the presence of opium? On the whole, I am inclined to reply in the affirmative." I regret I cannot agree with him in this conclusion, since several other substances produce the same colour, and three of these are very likely to be met with in the alimentary canal, namely, the acetates, (thus acetate of ammonia or acetate of potash administered medicinally,) mustard, and saliva. In regard to the latter substance, he remarks, "it is seldom possible to procure a distinct blood-red coloration from the saliva, except by evaporating a large quantity to dryness, and redissolving the residue in a small quantity of water; and I question whether it can be separated at all after the saliva is mixed with the complex contents of the stomach." I am sorry again to be at issue with so high an authority, but our results being discordant, it is but right I should state my experience. In a large majority of cases I find saliva is distinctly and unequivocally reddened by the persalts of iron. In some few cases only have I observed this test indistinct. I have several times obtained from the stomach of subjects in the dissecting-room a liquor which reddened the salts of iron.

Estimation of the Purity and Strength of Opium.—Opium is brought into the market of very unequal degrees of purity, in consequence of its having been subjected to adulteration; and partly, perhaps, from the employment of different methods of preparation. Moreover, its consistence is by no means uniform; that of some kinds being quite soft (as the Patna and Benares), and of others quite hard (as some of the Egyptian opium). As this difformity depends on the presence of unequal quantities of water, an obvious variation of strength is the consequence. Moreover, the quantity of morphia in good opium of different or even of the same localities is by no means constant. Furthermore, opium, from which the morphia has been abstracted, has been fraudulently introduced into commerce (*Journ. de Pharm.* xxiv. 325, 446; xxv. 297; also *Journ. de Chim. Méd.* iv. 2nde Sér. pp. 335, 432). It is highly desirable, therefore, to have a ready, easy, accurate, and precise method of determining the purity and strength of opium. I regret that such a method is still a desideratum.

1. *Of the Estimation of the Water.*—This will be readily judged of by the consistence; but still better by observing the loss on drying a given weight of the opium.

2. *Of the Detection of Foreign Bodies.*—A physical examination of opium will frequently detect impurities (as leaves, bullets, stones, fruits, &c.) If a decoction of the suspected opium be made and strained, various foreign matters are often left on the sieve. In this way I obtained 10 drachms of small stones and gravel from 10 ounces of opium. On another occasion I detected a gelatiniform substance, which was insoluble in both water and alcohol, in an opium (Egyptian?), the tincture of which could not be rendered clear by filtration. A decoction of opium, when cold, should not give a blue precipitate (*iodide of starch*) on the addition of tincture of iodine: if it do, the presence of starch or flour is obvious.

3. *Of the Estimation of the Quantity of Morphia in Opium.* (*Morphiometry.*)—This is a subject of no slight difficulty. A remark connected with it, which deserves notice, is, that there is no constant ratio between the quantity of morphia in a given sample of opium and that of any other constituent. Berthemot (*Journ. de Pharm.* xxiv. 445), however, is of opinion that it is in the ratio of that of the meconic acid. The correctness of this opinion is not borne out by my own observation, and was positively denied by Robiquet (*Ibid.* p. 438). It follows, therefore, that the extraction of the morphia is the only true morphiometrical method of proceeding. Several methods of effecting this have been proposed.

a. Process of the Edinburgh Pharmacopœia.—"A solution of 100 grains, macerated 24 hours, in two fluidounces of water, filtered, and strongly squeezed in a cloth, if precipitated by a cold solution of half an ounce of carbonate of soda in two waters, and heated till the precipitate shrinks and fuses, will yield a solid mass on cooling, which weighs, when dry, at least 11 grains, and, if pulverized, dissolves entirely in solution of oxalic acid."—*Ph. Ed.* 1839. This is a modification of the process for procuring disulphate of quina (see p. 1013), and of estimating the quality of yellow bark (see p. 999). The fused mass obtained by the process is morphia, narcotine, and resinous extractive. From the trials I have made of this process, I am inclined to speak very doubtfully of its value. Morphia is soluble in a solution of carbonate of soda, and, therefore, variations in the degree of heat applied to the liquor, as well as in the time to which it is subjected to heat, will be attended with corresponding results. Nay, if the heat be maintained too long, the whole of the morphia will be dissolved! Hence, therefore, to prove successful, this process requires more precautions than the directions of the College would lead one to imagine.

b. Thiboumary's process.—Prepare an aqueous extract of the opium to be examined, and dissolve it in water. Add ammonia to the boiling liquor, [taking care not to add much excess] and, when cool, filter. Wash the precipitate on the filter first with cold water, then with proof-spirit, and afterwards dry it. Then boil it with animal charcoal in rectified spirit, and evaporate the filtered liquor, by which crystals of morphia are procured (*Journ. de Chim.-Méd.* iv. 405, 2e Sér.)—The following modifications of the process will be found valuable. After the precipitate on the filter has been washed with water, dry it, mix it with proof spirit, and add drop by drop acetic acid until the solution slightly reddens litmus. By this means the morphia, and not the narcotina, will be dissolved. Precipitate the morphia from the filtered solution by ammonia.—This perhaps is the best process for determining the goodness of opium, at present known.

c. Berthemot's process.—To a filtered infusion of opium add chloride of calcium, boil, filter (to get rid of the meconate and sulphate of lime) and evaporate to the consistence of syrup. The residuum should form a granular crystalline mass (principally hydrochlorate of morphia), which is to be separated from the mother water and purified by resolution in water (*Journ. de Pharm.* xxiv. 448). This is an application of Gregory's process hereafter to be described. It appears to be an objectionable method; as a considerable portion of the morphia will be left in the mother-liquor.

d. Couerbe's process.—Boil an infusion of opium with lime (which dissolves the morphia), and filter through paper. Saturate the filtered liquor with an acid, and precipitate the morphia by ammonia. This, perhaps, is the most speedy process for the detection of opium.

PHYSIOLOGICAL EFFECTS. (*a.*) *On vegetables.*—The effects of opium on plants have been principally examined by Marcet (*Ann. de Chim. et Phys.* xxix. 20) and Macaire (*Ibid.* xxxix. 213). The latter states, that the stamens of the barberry (*Berberis vulgaris*) and the leaves of the sensitive plant lost their contractility, and soon died, when stems of these vegetables were immersed in an aqueous solution of opium (see some remarks on this subject at p. 384). In one experiment which I have been making on this subject, I immersed a flowering stem of the barberry in water, to which tincture of opium had been added. In thirty hours I could not perceive any effect on the plant. The stamens, even in the overblown flowers, still retained their contractility. Charvet states that he watered a sensitive plant with a moderately strong infusion of opium for forty-eight days, without effecting the irritability of the plant.

(*b.*) *On animals generally.*—The operation of opium on animals has repeatedly been the subject of physiological investigation. An abstract of a considerable number of experiments made by various individuals has been published by Wibmer (*Wirk. d. Arzneim. u. Gifte*, Bd. iv. S. 74, et seq.) The most complete and extended series of experiments is that made by Charvet (*De l'Action comp. de l'Opium*, Paris, 1826), on the different classes of animals, for the purpose of determining its comparative action. While on all it has been found to act as a poison, its effects are observed to vary somewhat, according to the degree of development of the nervous system.

In the invertebrated animals opium causes weakness or paralysis of the contractile tissues, with gradual sinking, and death. Thus in the *polygastrica* and the *annelides*, it first accelerates the animal movements, but afterwards paralyses them. Now in the lower invertebrata, a central nervous apparatus is altogether wanting, while in the higher animals of this class, it is not sufficiently developed to exercise that influence over the whole individual which we observe it to possess in the vertebrated classes.

In the vertebrated animals we have a high development of the central organs of the nervous system, and a consequent increase in the number of symptoms caused by opium. Thus in *fishes*, *amphibials*, and *reptiles*, we observe, in addition to the weakened and paralytic condition of the contractile tissues, convulsions. In the fish the convulsive contractions bend the body laterally; whereas, in the other vertebrata, the superior dorsal muscles are affected, and hence the head and tail are elevated. These differences obviously depend on the disposition of the muscles. Proceeding in the ascending order, we observe in *birds* and *mammals*, besides the paralysis and convulsions, stupor. The last-mentioned symptom, however, is principally manifested in the highest of the mammals,—man,—that is, in that animal which has the most highly developed brain, while, in some of the lower mammals, as the ruminants, it is scarcely observed; and even in the carnivora, as dogs, it is very slight. It is somewhat remarkable that the stupor is more manifest in birds than in the lower mammals. Moreover it is not undeserving of notice, that the operation of opium on the different races of man is not uniform, as already noticed (see p. 39). On the Negro, the Malay, and the Javanese, it more frequently acts as an excitant, causing furious madness, or delirium and convulsions. Are we to ascribe the less frequent occurrence of these symptoms in the Caucasian variety, to the greater development of his brain? In conclusion, then, it appears that the effects of opium on the animal kingdom have a relation to the degree of development and influence of the nervous system.

(*c.*) *On man.*—I propose to examine the effects of opium under three heads or subdivisions:—*first*, the effects of one or a few doses employed medicinally; *secondly*, the effects of the habitual employment of opium, either by chewing or smoking it; and *thirdly*, its effects on the different systems of organs.

1. *Effects of one or a few doses.*—We may consider these under three degrees of operation.

First degree of operation.—In *small doses*, as from a quarter of a grain to one grain, opium generally acts as a stimulant, though in this respect the symptoms are not uniform. Usually the vascular system is somewhat excited, and a sensation of fulness is experienced about the head. Dr. Crumpe (*Inq. into the Nat. and Prop. of Opium*, p. 33, 1793) took one grain of opium when his pulse was at 70, and the alteration in the number of beats was as follows:—

In........ 2	5	10	15	20	25	30	35	40	45	50	55	60 minutes.
Pulse beat 70	74	76	76	74	74	74	72	72	70	70	70	70 „

The excitement in the cerebral vascular system is accompanied by alterations in the condition of the nervous functions. The mind is usually exhilarated; the ideas flow more quickly; a pleasurable or comfortable condition of the whole system is experienced, difficult to describe; there is a capability of greater exertion than usual. These symptoms are followed by a diminution of muscular power, and of susceptibility to the impression of external objects; a desire of repose is experienced, with a tendency to sleep. While these effects are taking place, the mouth and throat become dry, and hunger is diminished, though the thirst is increased; and slight constipation usually follows. Such are the ordinary effects of a small dose of opium on persons unaccustomed to its use. By repetition, however, its influence becomes considerably diminished; and those, therefore, who resort to it for the purpose of producing a pleasurable excitement, are obliged to augment the dose to keep up an equal effect (see pp. 36-37).

Second degree of operation.—Given in a *full medicinal* dose (as from two to four grains), the stage of excitement is soon followed by that of depression. The pulse, which at first is increased in fulness and frequency, is afterwards reduced below the natural standard. The effects of two grains and a half on Dr. Crumpe (when his pulse was beating at 70) were as follows (*op. supra cit.* p. 35.):—

In........	5	10	15	20	25	30	35	40	45	50	55	60	75	90 minutes.
Pulse beat	74	74	74	76	78	80	72	70	64	64	66	70	70	70 ,,

The skin becomes hot; the mouth and throat dry; the appetite diminished; the thirst increased; and frequently nausea, or even vomiting, are induced. The symptoms of excitement soon pass away, and a state of torpor succeeds: the individual feels indisposed to exertion; the muscular system appears enfeebled; the force of external impressions on the organs of the senses is diminished; and the ideas become confused. This state is followed by an almost irresistible desire of sleep, which is frequently attended by dreams—sometimes of a pleasing, at others of a frightful nature.

These effects are usually succeeded by constipation (which may continue for several days), by nausea, furred tongue, headache, and listlessness.

Third degree of operation: poisonous effects of opium.—Dr. Christison has so briefly summed up the effects of a poisonous dose of opium, that I cannot do better than quote his statement:—"The symptoms of poisoning with opium, when it is administered at once in a dangerous dose, begin with giddiness and stupor, generally without any previous stimulus. The stupor rapidly increasing, the person becomes motionless and insensible to external impression; he breathes very slowly, generally lies quite still, with the eyes shut and the pupils contracted; and the whole expression of the countenance is that of deep and perfect repose. As the poisoning advances, the features become ghastly, the pulse feeble and imperceptible, the muscles exceedingly relaxed, and, unless assistance is speedily procured, death ensues. If the person recovers, the sopor is succeeded by prolonged sleep, which commonly ends in twenty-four or thirty-six hours, and is followed by nausea, vomiting, giddiness, and loathing of food."

2. *Habitual Use of Opium.*—Of those who habitually employ opium as an intoxicant, some chew, or eat it; others smoke it.

Opium-eating.—The ill effects of opium-eating have been described by most travellers in Turkey and Persia, where this practice is carried to a greater extent than in any other part of the world. In the writings of Dr. Russell (*Nat. Hist. of Aleppo*, i. 126, 1794), Chardin (*Voy. en Perse et autres Lieux de l'Orient.*), the Baron de Tott (*Mém. sur les Turcs et les Tart.* 1785), Pouqueville (*Voy. en Morée, en Constant.* t. ii. p. 123, 1805), and Madden (*Travels in Turkey*, &c. vol. i. p. 23, 1829), will be found notices of these effects. The following extract is from one of the latest accounts, that of Dr. Oppenheim (*Ueber d. Zust. d. Heilk. u. über d. Volkskrankh. in d. Europ. u. Asiat.-Turkei.* Hamb. 1833. Also *Brit. and For. Med. Rev.* vol. iv. p. 394):—

"The causes leading to the use of opium are many, and among them may be reckoned the following:—long-continued diarrhœa, as a remedy for which opium is used in the first instance, and its use afterwards continued from habit; chronic coughs, in which opium is also used as a popular medicine; habitual drunkards also frequently have recourse to opium as a new stimulus, after they have abjured wine in some fit of repentance. Persons holding high offices or dignities in the state also have recourse to opium, when the preservation of their character forbids them the use of wine: some very strict believers also take opium as a restorative in cases of great exertion, as the *Tatars* (couriers), who travel with astonishing celerity.

"Opium-eaters generally begin with doses of from half a grain to two grains, and gradually increase the quantity till it amounts to two drachms and sometimes more a day; they usually take the opium in pills, but avoid drinking any water after having swallowed them, as this is said to produce violent colic: to make it more palatable, it is sometimes mixed with syrups or thickened juices; but in this form it is less intoxicating and resembles mead; it is then taken with a spoon or is dried in small cakes, with the words '*Mash Allah,*' 'the work of God,' imprinted on them.

"The effect of the opium manifests itself one or two hours after it has been taken, and lasts for five or six hours, according to the dose taken and the idiosyncrasy of the subject. In persons accustomed to take it, it produces a high degree of animation which the *Theriaki* (opium-eaters) represent as the acmé of happiness.

"The habitual opium-eater is instantly recognised by his appearance. A total attenuation of body, a withered, yellow countenance, a lame gait, a bending of the spine, frequently to such a degree as to assume a circular form, and glossy, deep sunken eyes, betray him at the first glance. The digestive organs are in the highest degree disturbed, the sufferer eats scarcely any thing, and has hardly one evacuation in a week; his mental and bodily powers are destroyed,—he is impotent. By degrees, as the habit becomes more confirmed, his strength continues decreasing, the craving for the stimulus becomes even greater, and, to produce the desired effect, the dose must constantly be augmented.

"When the dose of two or three drachms a day no longer produces the beatific intoxication so eagerly sought by the Opiophagi, they mix the opium with [corrosive *sublimate*, increasing the quantity till it reaches to ten grains a day; it then acts as a stimulant.

"After long indulgence the opium-eater becomes subject to nervous or neuralgic pains, to which opium itself brings no relief. These people seldom attain the age of forty, if they have begun to use opium at an early age. The fasts in the month of Ramasan are for them fraught with the most dreadful tortures, as during the whole of that month they are not allowed to take any thing during the day. It is said that, to assuage their sufferings, they swallow, before the morning prayer, besides the usual dose, a certain number of other doses, each wrapped up in its particular paper, having previously calculated the time when each envelope shall be unfolded, and allow the pill to produce the effects of their usual allowance. When this baneful habit has become confirmed, it is almost impossible to break it off; the torments of the opium-eater when deprived of this stimulant, are as dreadful as his bliss is complete when he has taken it; to him night brings the torments of hell, day the bliss of paradise. Those who do make the attempt to discontinue the use of opium, usually mix it with wax, and daily diminishing the quantity of the opium, the pill at last contains nothing but wax."

For an account of the effects produced on English opium-eaters I may refer to the well-known confessions of Mr. De Quincey (*Confessions of an English Opium-eater*) and of the late Mr. S. T. Coleridge, (Cottle's *Early Recollect. of the late S. T. Coleridge*, vol. ii. p. 149, et seq. Lond. 1837). Numerous instances of the enormous quantities of opium which by habit may be taken with impunity have been published. One of these I have already referred to (see p. 36). Dr. Chapman (*Elem. of Therap.* ii. 199) tells us that he knew a wine-glassful of laudanum to be given several times in the twenty-four hours. "But what is still more extraordinary," says this author, "in a case of cancer of the uterus, which was under the care of two highly respectable physicians (Drs. Monges and La Roche) of Philadelphia, the quantity of laudanum was gradually increased to three pints, besides a considerable quantity of solid opium in the same period." Pinel mentions a lady who required 120 grains of opium to give her ease in cancer of the uterus.

Some doubt has been recently began to be entertained as to the alleged injurious effects of opium-eating on the health, and its tendency to shorten life; and it must be confessed that in several known cases which have occurred in this country, no ill effects have been observable. Dr. Christison (*Treat. on Poisons*) has given abstracts of eleven cases, the general result of whose histories "would rather tend to throw doubt over the popular opinion." A few years ago, a Life-Assurance Company, acting on this general opinion, resisted payment of a sum of money, on the ground that the insurer (the late Earl of Mar) had concealed from them a habit which tends to shorten life. But the case was ultimately compromised. Dr. Burnes (*Sketch of Hist. of Cutch*, p. 9, Edinb. 1839) asserts that the natives of Cutch do not suffer much from opium-eating.

In those cases of disease (usually cancerous) in which enormous doses of opium are taken to alleviate pain, I have invariably observed constipation produced. But Dr. Christison says, "constipation is by no means a general effect of the continued use of opium. In some of the cases mentioned above, no laxatives have been required; in others, a gentle laxative once a week is sufficient."

Opium-smoking.—I have already referred to the enormous quantities of opium consumed in China and the islands of the Indian Archipelago by smoking. The *smokeable extract* (see p. 1279) is made into pills about the size of a pea. "One of these being put into the small tube that projects from the side of the opium-pipe, that tube is applied to a lamp, and the pill being lighted, is consumed at one whiff or inflation of the lungs, attended with a whistling noise. The smoke is never emitted by the mouth, but usually receives vent through the nostrils, and sometimes, by adepts, through the passage of the ears and eyes" (Marsden, *Hist. of Sumatra*, p. 278, 3rd ed.) The pipe employed is not like that of an ordinary tobacco-pipe (see a figure of it in Mr. Davis's work, entitled *The Chinese*, vol. ii. p. 459). That the immoderate practice of opium-smoking must be highly detrimental to health, cannot for one moment be doubted. But there is at present no evidence before us to prove that a moderate enjoyment of it is injurious. On the contrary, the statements of Botta (Froriep's *Notizen*, xxvi.) seem to negative such a supposition. And Marsden (*op. supra cit.* p. 278) observes that "the *Limun* and *Batang Assei* gold-traders, who are an active and laborious class of men, but yet indulge as freely in opium as any others whatever, are, notwithstanding, the most healthy and vigorous people to be met with on the island." The ill effects ascribed to this practice, by Medhurst (*China*, 1838) apply probably merely to cases where opium-smoking has been carried to excess. In conclusion I would observe that a good account of the effects of opium-smoking, by an unbiassed and professional witness, is still a desideratum; and until we obtain this we should be cautious in adopting the statements of over-zealous anti-opium partisans. And we should be further careful not to assume hastily, because opium in large doses, when taken by the mouth, is a powerful poison, and when smoked to excess is injurious to health, that, therefore, the moderate employment of it is necessarily detrimental. Tobacco is an instance in point. Either swallowed or smoked to excess it is a violent poison; yet as I have before remarked (p. 871) I am not acquainted with any well-ascertained ill effects arising from the moderate enjoyment of tobacco-smoking.

4. *Action of Opium on the different organs.*—In discussing this subject, it will be convenient to consider the organs arranged in groups or systems devoted to some common functions.

α. *On the Cerebro-spinal System.*—Taken in small or moderate doses, opium first produces excitement of the vascular system of the brain, accompanied with corresponding excitement in the cerebro-spinal functions, as already stated. This state, however, is succeeded by that of depression. In large or poisonous doses the leading symptom is sopor—that is, a state analogous to profound sleep, from which the patient *can* be roused, though with difficulty. In the latter stage of poisoning this symptom is succeeded by coma—that is, by profound sleep, from which the patient *cannot* be roused. Sopor is usually accompanied either with actual paralysis of the muscular fibres, or with a diminished power almost amounting to it; both of which states doubtless arise from the same condition of the cerebro-spinal system which produces sopor or coma. This state is usually supposed to be sanguineous (venous) congestion. The pupil is usually contracted,—a circumstance deserving of especial notice.

But in some cases we have delirium in the place of sopor or coma, and convulsions instead of paralysis. These are to be regarded as exceptions to the general rule, and are accounted for, pathologically, by supposing they depend on a state of irritation or excitement set up in the nervous centres, and which usually, though not invariably, terminates in congestion.

Another effect of opium is diminished sensibility. Thus the whole body becomes less susceptible of painful impressions ; in dangerous and fatal cases, the eyes are insensible to light,—the ears to sound. This state has been accounted for by supposing that the functions of the sensitive nerves are diminished or suspended by the congested condition of the brain.

From these effects of opium on the cerebro-spinal system the following inferences may be drawn :—

(*a.*) That it is an objectionable agent in apoplexy, phrenitis, and paralysis.

(*b.*) That under proper regulations it is a remedy which may be used to stimulate the cerebro-vascular system, to promote sleep, to diminish inordinate muscular contraction, to diminish the sensibility of the body, and thereby to alleviate pain.

β. *On the Digestive System.*—The usual effects of opium on the organs of digestion are the following :—It diminishes secretion and exhalation from the whole canal ; thus it causes dryness of the mouth and throat, and diminishes the liquidity of the stools : it excites thirst, lessens hunger, checks the digestive process (for in some animals poisoned by opium, food which they had taken a short time previously has been found in the stomach unchanged) : and in some cases it excites vomiting. Mr. Kerr (*Med. Obs. and Inq.* vol. v. p. 321) tells us, that in the famine which prevailed in the East Indies, in the year 1770, opium was purchased by the unhappy sufferers, at extraordinary prices, to allay the cravings of hunger, and to banish the dreadful prospect of death. The Tatar couriers, who travel immense distances in a short period of time, take opium only during the journey, to support them. It diminishes the sensibility and contractility of the digestive organs : hence the difficulty, in severe cases of poisoning, of producing vomiting. The constipation which follows the use of opium depends partly on the same cause, and in part also on the diminished excretion of bile, and diminished secretion from the gastro-intestinal mucous membrane. — Sprœgel (quoted by Christen, *Opium hist. chem. and pharm. invest.* p. 66, 1820) found the choledic ducts of animals, to whom opium had been given, filled with bile; yet it had not passed into the intestines, for the fæces were scarcely tinged by it, but had the same appearance which we observe them to have in jaundiced patients.

From these effects of opium on the digestive organs, we may draw the following inferences:—

(*a.*) That in diminished secretion from the gastro-intestinal membrane, in extreme thirst, in loss of appetite and weak digestion, in obstinate costiveness, and in diminished excretion of bile, opium is an objectionable remedy.

(*b.*) That under proper regulations, opium is an admissible remedy for the following purposes:—To diminish excessive hunger; to allay pain, when accompanied by inflammation; to diminish the sensibility of the digestive organs, as in cases of acrid poisoning, and in the passage of biliary calculi; to produce relaxation of the muscular fibres of the alimentary canal (as in colic and diarrhœa), and of the gall ducts (as in the passage of calculi), and to diminish excessive secretion from the intestinal canal, as in diarrhœa.

γ. *On the Vascular System.*—Opium certainly influences the movements of the heart and arteries; but the effect is by no means uniform, since in some cases we observe the pulse increased, in others diminished in frequency; and a like variation is noticed in its fulness. Moreover, these variations occur in the same case at different stages. From Dr. Crumpe's experiments, before referred to, it appears that after the use of a moderate dose of opium the frequency of the pulse is first increased, then decreased. The diameter of the artery, and the force and regularity with which the pulsations are effected, are properties of the pulse readily, but by no means uniformly, affected by opium. To a certain extent we observe a relation between the condition of the pulse and that of the cerebro-spinal functions. Thus, when convulsions occur, we usually have a hurried pulse,—whereas, when sopor or coma supervenes, the pulse becomes weaker or slower, or both, than natural. But these conditions are by no means uniform. A frequent pulse, with a feverish condition of body, are common consequences of the use of small or moderate doses of opium; and in poisoning by this drug, a quick pulse, even though no convulsive movements are observed, is by no means rare. A poisonous dose of opium usually enfeebles the pulse, sometimes makes it fuller, often renders it irregular, and towards death always renders it feeble, and often imperceptible. We can easily believe that the muscular fibres of the heart must experience, from the use of a large dose of opium, a diminution of power in common with other muscular fibres, and hence the contractions become weaker. It is also probable that the contractile coat of the arteries and capillaries equally suffers. Now Wirtensohn (quoted by Barbier, *Traité Elém. de Mat. Méd.* t. ii. 2me éd.) supposes that the fulness of the pulse sometimes observed in poisoning by opium, arises from the insufficient power of the heart to propel the blood through this paralysed or weakened capillary system. The accumulation of blood observed in the large venous trunks and cavities of the right side of the heart, is supposed to arise from the obstruction experienced to its passage through the pulmonary vessels.

In attempting to lay down indications and contraindications for the use of opium as a remedy for morbid conditions of the circulation, two difficulties present themselves:—

first, the same condition of the vascular system may be induced by various and even opposite causes, for some of which opium may be an appropriate remedy, while for others it may prove an injurious agent; *secondly*, the effects of opium on the circulation are not uniform, and hence not to be relied on. The following conclusions, therefore, are submitted with considerable hesitation as to the universality of their application:—

(*a.*) That in increased activity of the vascular system with considerable power, or with diminished secretions and exhalations, and in morbid conditions of the vascular system with a tendency to sopor or coma, opium is an objectionable remedy.

(*b.*) That in vascular excitement with great diminution of power, as after hemorrhage; in rapidity of pulse with nervous excitement, but without febrile or inflammatory symptoms, as in some forms of hysteria; and in various morbid conditions of the pulse attended with acute pain, spasm, or profuse secretion and exhalation, but without visceral inflammation, opium often proves a serviceable agent.

δ. *On the Respiratory System.*—In studying the effects of opium on respiration, we must remember that the mechanical part of this function is effected by muscular agency; and as the contractility of the muscular fibre is powerfully influenced by opium, so the respiratory movements are also necessarily modified. Occasionally the primary effect is a slight increase in their frequency; but the secondary effect is almost always of an opposite kind, the respiration being slower than usual; and when coma is present, the breathing is usually gentle, so as scarcely to be perceived; but in some cases it is stertorous. In fact, a paralytic condition of the respiratory muscles takes place, in consequence of which inspiration becomes gradually more and more difficult, until eventually asphyxia is induced, which is usually the immediate cause of death.

Another effect ascribed to opium is, that it checks the arterialization of the blood, by diminishing the supply of nervous agency, without which the decarbonization or oxygenization of this fluid cannot take place. It is difficult, however, to distinguish the consequences of this effect from those of asphyxia produced by paralysis of the respiratory muscles.

The third point of view under which we have to examine the influence of opium on the respiratory system is, its effect on the membrane lining the trachea and bronchial tubes and cells. In the first place, it diminishes the sensibility of this in common with other parts of the body; and, secondly, it checks exhalation and mucous secretion.

A knowledge of these effects of opium on the organs of respiration leads to the following conclusions:—

(*a.*) That this agent is contra-indicated in difficulty of breathing arising from a deficient supply of nervous energy, as in apoplectic cases; that it is improper where the venous is imperfectly converted into arterial blood; and, lastly, that it is improper in the first stage of catarrh and peripneumony, both from its checking secretion, and from its influence over the process of arterialization.

(*b.*) That in cases of poisoning by opium, artificial respiration is indicated to prevent asphyxia.

(*c.*) That opium may, under proper regulations, be useful to diminish the contractility of the muscles of respiration, or of the muscular fibres of the air tubes, as in spasmodic asthma; to diminish the sensibility of the bronchia, in the second stage of catarrh, and thereby to allay cough by lessening the influence of the cold air; and lastly, to counteract excessive bronchial secretion.

ε. *On the Urinary System.*—Authors are not agreed as to the effect of opium on the kidneys; some asserting that it increases, others that it diminishes, the quantity of urine secreted. Thus, Dr. Michaelis (*Med. Comm.* i. p. 307, 1784) asserts, that in giving opium in venereal cases, he has sometimes found the secretion of urine exceeding in quantity all the fluids drank. It cannot, however, be doubted, that in most cases a moderate quantity of opium diminishes the excretion, while at the same time it makes this fluid turbid and thick. This does not, however, prove the kidneys to be the part affected. Sprœgel (cited by Christen, *op. supra cit.* p. 68) tells us, that when he gave two scruples of opium to dogs, no urine was passed for two days; and, under the influence of two drachms of this medicine, the urine was retained for three days. But dissection showed that the kidneys had not ceased to secrete urine, since the bladder was found distended with this secretion, and its parietes without the least sign of contractility on the application of nitric acid; so that it would appear the non-evacuation of the urine was referrible to the insensible and paralysed condition of the vesical coats, and not to the diminished urinary secretion. Charvet (*op. supra cit.* p. 221) has also noticed, in dogs, cats, and hares, that the urinary bladder was distended. As, however, in man, opium usually increases the cutaneous exhalation, while in other mammals this effect was not observed, we must be careful in transferring our conclusions with respect to the influence of opium on one order of animals to another order. But I ought to add, that Welper, of Berlin, always found the bladder filled with urine both in man and animals. In some morbid conditions of system, opium certainly checks the urinary secretion. This is decidedly the case in diabetes, (see Prout, *Inq. into the Nat. and Treat. of Affect. of the Urin. Org.* p. 74, 2nd ed.)

The ureters and bladder have their sensibility and contractility diminished by opium. With respect to the effect on the first of these parts, the statement seems proved by the well-known beneficial influence of opium in cases where calculi are descending along these tubes. The acute pain is frequently relieved, and the ureters relaxed, so that large calculi are sometimes allowed to descend from the kidneys along them.

Besides the observations of Sprœgel, before referred to, we have other evidence of the paralysing and benumbing effect of opium on the bladder. In some cases of poisoning by this substance, the bladder has been found to be unable to contract on its contents. In some other instances, the sphincter of the bladder has been paralysed, and in consequence the urine was voided involuntarily. (See *Lond. Med. and Phys. Journ.* vol. xxviii. 80; and xxxi. 193; and *Lond. Med. Rev.* for 1811, p. 371). Barbier has also noticed the same thing, and quotes the experience of Dr. Bally to the same effect. The effect of morphia on the bladder is more marked than that of opium.

These remarks on the effect of opium on the urinary organs lead to the following conclusions:—

(*a.*) That in diminished sensibility or contractility, or both, of the ureters or bladder, the use of opium is objectionable.

(*b.*) That, under proper regulations, opium may be a valuable remedy to dull the sensibility of the pelvis of the kidney, in cases of renal calculi; to allay pain and produce relaxation of the ureters when calculi are passing along these tubes; and lastly, to diminish irritation of the bladder, whether produced by cantharides or other causes.

ζ. *On the Sexual System.* (*a.*) *Of men.*—Opium has long been celebrated as an aphrodisiac; and we are told that the Japanese, Chinese, Indians, Persians, Egyptians, and Turks, use it as such. Among other symptoms of excitement produced by the habitual use of large doses of opium, it is not improbable that there may be a heightened condition of the venereal feelings, in consequence of an increased determination of blood to that part of the brain supposed to be devoted to the sexual function, which part the phrenologists assert to be the cerebellum. Moreover it is said to produce erection; and in support of this statement the following strange story is told:—"Turcæ ad Levenzinum, 1664, contra Comitem Lud. Souches pugnantes, opio exaltati, turpiter cæsi et octo mille numero occisi mentulas rigidas tulere" (Christen, *op. supra cit.* p. 53). Cabanis (*Rapp. du Phys. et du Morale de l'Homme*) adopts this story, and ascribes the above-mentioned condition to the convulsive movements which affect the body *in articulo mortis*, and not to an aphrodisiac operation. The effect alluded to, if it really do take place, is probably to be referred to the accumulation of blood in the erectile tissues, arising from a disordered state of the circulation. Impotence is ascribed by some to opium-eating, and is a more probable effect. I am unacquainted with any facts on which to ground any well-founded opinion as to the power of opium to diminish or increase the spermatic secretion.

(*b.*) *Of women.*—We have little positive information as to the effects of opium on the reproductive organs of women. It is said that the catamenia, lochia, and secretion of milk, are unaffected by it, but that it causes intumescence of the nipples. Under its use the milk acquires a narcotic property (see p. 1299). Furthermore, at times it has appeared to have an injurious effect on the fœtus *in utero* (F. H. Ramsbotham, *Lond. Med. Gaz.* vol. xiv. p. 84). Opium appears to act on the uterus as on most other contractile parts of the body: that is, it diminishes the contractility and sensibility of this viscus.

From these observations it follows:—

(*a.*) That wet nurses and pregnant women must employ opium with great caution, as its use by them may endanger the life of the child.

(*b.*) That opium may be employed to allay pain, spasm, and morbid irritation of the sexual organs in either sex; and that its use in the female is not likely to be attended with retention of the uterine or mammary secretions.

(*c.*) That the influence of opium on the venereal appetite is not sufficiently and satisfactorily determined to permit us to make any practical application of it.

η. *On the Cutaneous System.*—Considered as an organ of sense, the cutaneous system is affected by opium in an analogous way to the other organs of sense; that is, its sensibility is diminished. But the skin has another function—that of excretion, and which does not appear to be at all diminished, nay, to be increased, by the use of opium; one of the usual effects of this medicine being perspiration, which is in some cases attended with a pricking or itching of the skin, and occasionally with an eruption. In fact, taken medicinally, opium is a powerful sudorific, and often proves so even when acting as a poison. "In a fatal case, which I examined judicially," says Dr. Christison, "the sheets were completely soaked to a considerable distance around the body."

From these remarks it follows:—

(*a.*) That opium is not likely to relieve loss of feeling or excessive perspiration; but may, on the other hand, under some conditions of the system, prove injurious.

(*b.*) That opium is adapted to the relief of pain or excessive sensibility of the skin and for provoking perspiration; but the propriety of its use for these purposes must be determined by reference to the condition of the system generally. Experience proves that when the skin is very hot, and especially if it be also dry, opium is seldom beneficial but often hurtful.

θ. *Topical effects.*—The local effects of opium are, compared with the general ones, very slight. Applied to the eye, internal membrane of the nose, urethra, cutis vera, wounds or ulcers, it first causes pain, a sense of heat, and inflammation; but these effects subside, and are followed by a weakened or a paralytic condition of the sensitive and motor nerves. Several physiologists have proved that opium causes a local paralysis of the nerves; and Müller (*Phys.* by Baly, vol. i. p. 630) has shewn that the narcotic action is not propagated from the trunk of a nerve to its branches. Crumpe (*op. supra cit.*) shewed, that, at the end of thirty minutes, the eye to which opium had been applied was somewhat less susceptible of the action of alcohol. Scarcely any obvious effect results from the application of opium to the ordinary integument, on account of the barrier presented by the cuticle. Employed endermically the effects are much more powerful.

POST-MORTEM APPEARANCES.—The most important appearances are those observed in the nervous system; such as turgescence of vessels, effusion of water or of coagulable lymph, and occasionally, though rarely, extravasation of blood.

Whenever redness of the digestive canal is observed, I believe it is referrible to the use of some irritants (such as spirits, ammonia, or emetics) taken either with, or after the use of, opium.

MODUS OPERANDI.—Under this head I propose to examine several points not hitherto noticed, and which involve the theory of the operation of opium on the system.

1. *The Odorous and Active Principles of Opium are absorbed.*—This assertion is proved by the following facts:—

(*a.*) The odour of opium is sometimes recognizable in the secretions and exhalations: thus it is well known that the opiate odour is frequently detected in the breath of persons poisoned by this drug; and Barbier (*Traité Elem. de Mat. Méd.* ii. 732, 2de ed.) states, it may be also noticed in the urine and sweat.

(*b.*) The secretions, in some cases, appear to possess narcotic properties. Barbier mentions the case of an infant who was thrown into a state of narcotism of several hours' duration, in consequence of having sucked a nurse who had previously swallowed a dose of laudanum, to relieve a cramp of the stomach.

(*c.*) Meconic acid was detected, by two of my pupils, in the urine of a rabbit destroyed by opium.

(*d.*) Barruel asserts that he detected morphia in the blood and urine of a person under the influence of a poisonous dose of laudanum. As, however, these results have not been obtained by Dublanc or Lassaigne, the statement is not to be absolutely relied on.

2. *The Constitutional Effects of Opium depend in great part, if not wholly, on the absorption of its active principles.*—The facts on which this assumption rests, are:—

(*a.*) The active principles of opium are absorbed.

(*b.*) The constitutional effects of it are found to be proportionate to the absorbing powers of the part.

(*c.*) The effect of opium, when thrown into the jugular vein, is similar to, though more powerful than, that produced by its application to other parts of the body.

(*d.*) "The narcotic action does not re-act from a particular point of a nerve on the brain." (Müller, *Phys.* by Baly, i. 631.

3. *The Essential and Primary Operation of Opium is on the Nervous System* (*the Brain and Spinal Cord chiefly*).—This axiom is proved by reference to the already described effects of opium. An examination of these shews that—

(*a*) The most important effects of opium are direct and obvious lesions of the nervous functions.

(*b.*) The other effects of opium appear, for the most part, to be secondary,—that is, they arise out of the nervous lesions just referred to.

4. *Opium acts on the Nervous System as an Alterative.*—There are but three kinds of changes, compatible with life, which medicines can effect in the vital actions of an organ,—viz. an increase, a diminution, or an alteration of activity. A change in the intensity or energy merely of the vital actions of the nervous system, would not give a satisfactory explanation of the effects of opium. We are obliged, therefore, to assume that opium changes the quality of the actions. This is what is meant by the term *alterative.*

The inquiry into the nature and kind of influence exercised by opium over the system, presents an extensive field for speculation and hypothesis. Galen (*De Simpl. Med. Facult.* lib. viii.) declared opium to be cold in the fourth degree, and his authority long prevailed in the schools. It was first opposed by the *iatro-chemists*, who declared opium to be of a hot nature, (Wedelius, *Opiologia*, cap. vi. p. 26, 1682). Some, however, adopted a middle course, and asserted that it possessed both hot and cold particles (see Crumpe, *op. supra cit.* p. 91). The *iatro-mechanists* endeavoured to explain the operation of opium on mechanical principles. By some expansion, by others condensation of the blood, was supposed to be produced by the mechanical properties of the opiate particles acting on the nerves (see an account of these opinions by Tralles, *Usus Opii*, Sect. 1, 1757). Dr. Cullen (*Mat. Med.* ii. 225) considered opium to be a sedative, and referred its effects to its power of "diminishing the mobility, and in a certain manner suspending the motion, of the nervous fluid." Several later writers, Barbier (*Traité Elém. de Mat. Med.* ii. 2^nde éd.) for example, also call opium a sedative. Brown (*Elementa Medicinæ*) declared it to be a stimulant, and his opinion has been adopted by Crumpe (*op. supra cit.*), Murray (*Syst. of Mat. Med. and Therap.* Edinb.), and Dr. A. T. Thomson (*Elem. of Mat. Med. and Therap.*) in this country, and of course by the continental Brunonians, as well as by the partisans of the Italian theory of contra-stimulus. (See some remarks on the *modus operandi* of opium by Mr. Ward, in *Lond. Med. and Phys. Journ.* vols. vii. viii. and ix.) Fontana (*Treat. on the Venom of the Viper*, iii. 199) ascribed the operation of opium to changes which it induces in the blood. Mayer (quoted by Orfila, *Toxicol. Gén.*) declared opium to be both stimulant and sedative,—viz. stimulant to the nerves and vascular system, but sedative to the muscles and digestive organs. Lastly, Orfila (*Ibid.*) asserts that "opium, employed in strong doses, ought not to be ranked among the narcotics or the stimulants; it exerts a peculiar mode of action which cannot be designated by any of the terms at this moment employed in the Materia Medica." These examples, selected out of many opinions, will be sufficient to prove how little is really known of the real action of opium; and I believe we shall save ourselves much time and useless speculation by at once confessing our ignorance on this point.

5. *The operation of opium, compared with that of other cerebrospinants or narcotics, is distinguished by both positive and negative characteristics.* The symptoms whose presence constitute the *positive* characters are relaxation or paralysis of the contractile tissues, a tendency to sleep or stupor, a contracted pupil, and constipation. The symptoms whose absence furnish the *negative* characters are tetanic convulsion, delirium or inebriation, dilated pupil, syncope, gastro-intestinal irritation, and topical numbness.

These are the general characteristics of the opiate medication. To some of them occasional or perhaps frequent exceptions exist.

I have already pointed out the distinguishing effects of hyoscyamus (p. 851), belladonna and stramonium (p. 856). The topical numbness caused by aconite distinguishes its operation from that of opium. Moreover, in three cases of poisoning by this substance, which came under my notice, there was no stupor. Tobacco and foxglove enfeeble the vascular system, causing syncope; and they also produce gastro-intestinal irritation. Furthermore they have not that tendency to induce sleep which we observe after the use of opium. The speedy operation, short period of influence, and, usually, the presence of convulsions, distinguish the operation of hydrocyanic acid.

Indian hemp induces a cataleptic state (see Dr. O'Shaughnessy, *On the Prep. of the Indian Hemp*, Calc. 1839). Vinous liquids cause their well-known peculiar inebriation. Their effects in small doses agree, to a certain extent, with those of small doses of opium; but they are not equally available as antispasmodics. The peculiarities of the operation of conia have been pointed out (p. 1063-4).

USES.—Opium is undoubtedly the most important and valuable remedy of the whole Materia Medica. We have, for other medicines, one or more substitutes; but for opium we have none,—at least in the large majority of cases in which its peculiar and beneficial influence is required. Its good effects are not, as is the case with some valuable medicines, remote and contingent, but they are immediate, direct, and obvious; and its operation is not attended with pain or discomfort. Furthermore, it is applied, and with the greatest success, to the relief of maladies of every day's occurrence, some of which are attended with the most acute human suffering. These circumstances, with others not necessary here to enumerate, conspire to give to opium an interest not possessed by any other article of the Materia Medica.

We employ it to fulfil various indications; some of which have been already noticed. Thus we exhibit it, under certain regulations, to mitigate pain, to allay spasm, to promote sleep, to relieve nervous restlessness, to produce perspiration, and to check profuse mucous discharges from the bronchial tubes and gastro-intestinal canal. But experience has proved its value in relieving some diseases in which not one of these indications can be at all times distinctly traced.

1. *In Fevers.*—The consideration of the use of opium in fever presents peculiar difficulties. Though certain symptoms which occur in the course of this disease, are, under some circumstances, most advantageously treated by opium, yet, with one or more of these symptoms present, opium may, notwithstanding, be a very inappropriate remedy. The propriety or impropriety of its use, in such cases, must be determined by other circumstances, which, however, are exceedingly difficult to define and characterise. It should always be employed with great caution, giving it in small doses, and carefully watching its effects. The symptoms for which it has been resorted to are, *watchfulness*, *great restlessness*, *delirium*, *tremor*, and *diarrhœa*. When watchfulness and great restlessness are disproportionate, from first to last, to the disorder of the vascular system or of the constitution at large; or when these symptoms continue after excitement of the vascular system has been subdued by appropriate depletives, opium frequently proves a highly valuable remedy: nay, the safety of the patient often arises from its judicious employment. (See some interesting observations on this subject, by Dr. P. M. Latham, *Lond. Med. Gaz.* vol. x. pp. 11-12). The same remarks also apply to the employment of opium for the relief of delirium; but it may be added, that in patients who have been addicted to the use of spirituous liquors, the efficacy of opium in allaying delirium is greatest. Yet I have seen opium fail to relieve the delirium of fever, even when given apparently under favourable circumstances; and I have known opium restore the consciousness of a delirious patient, and yet the case has terminated fatally. If the skin be damp and the tongue moist, it rarely, I think, proves injurious. The absence, however, of these favourable conditions by no means precludes the employment of opium; but its efficacy is more doubtful. Dr. Holland (*Med. Notes and Reflect.* p. 427, 2nd ed. 1840) suggests that the condition of the pupil may serve

as a guide in some doubtful cases;—where it is contracted, opium being contra-indicated. A similar suggestion with respect to the use of belladonna was made by Dr. Graves (see p. 859), to which I have offered some objections. When sopor or coma supervenes in fever, the use of opium generally proves injurious. Recently the combination of opium and emetic tartar has been strongly recommended in fever with much cerebral disturbance, by Dr. Law (*Lond. Med. Gaz.* xviii. 538 and 694), and Dr. Graves (*Ibid.* xx. 538).

2. *Inflammatory diseases.*—Opium has long been regarded as an objectionable remedy in inflammation; but it is one we frequently resort to, either for the purpose of palliating particular symptoms, or even as a powerful auxiliary antiphlogistic remedy. The statement of Dr. Young (*Treat. on Opium*, p. 169. Lond. 1753), "that opium was improper in all those diseases in which bleeding was necessary," is, therefore, by no means correct in a very considerable number of instances. The objects for which opium is usually exhibited in inflammatory diseases, are to mitigate excessive pain, to allay spasm, to relieve great restlessness, to check excessive secretion, and to act as an antiphlogistic. In employing it as an anodyne, we are to bear in mind that it is applicable to those cases only in which the pain is disproportionate to the local vascular excitement; and even then it must be employed with considerable caution; for to "stupify the sensibility to pain, or to suspend any particular disorder of function, unless we can simultaneously lessen or remove the causes which create it, is often but to interpose a veil between our judgment and the impending danger" (Holland, *op. supra cit.* p. 424). As an antiphlogistic, it is best given in conjunction with calomel, as recommended by Dr. R. Hamilton, of Lynn (*Ed. Med. Comment.* ix. 191). The practice, however, does not prove equally successful in all forms of inflammation. It is best adapted for the disease when it affects membranous parts (see Brachet, *De l'Emploi de l'Opium dans les Phlegm. des Membr. muq. ser. et fibr.* 1828); and is much less beneficial in inflammation of the parenchymatous structure of organs. In *gastritis* and *enteritis* the use of opium has been strongly recommended by the late Dr. Armstrong (*Transactions of the Assoc. of Apothecaries*, 1823). After bleeding the patient to syncope, a full opiate (as 80 or 100 drops of the tincture, or three grains of soft opium) is to be administered, and if the stomach reject it, we may give it by injection. It acts on the skin, induces quiet and refreshing sleep, and prevents what is called the hemorrhagic reaction. If the urgent symptoms return when the patient awakes, the same mode of treatment is to be followed, but combining calomel with the opium. A third venesection is seldom required. In *peritonitis*, the same plan of treatment is to be adopted; but warm moist applications are on no account to be omitted. Of the great value of opiates in *puerperal fever* abundant evidence has been adduced by Dr. Ferguson, (*Essays on the most Import. Diseases of Women.* Part i. 1839). In *cystitis*, opium, preceded and accompanied by blood-letting and the warm bath, is a valuable remedy: it relieves the scalding pain, by diminishing the sensibility of this viscus to the presence of the urine, and also counteracts the spasmodic contractions. In *inflammation of the walls of the pelvis of the kidney, and also of the ureters*, especially when brought on by the presence of a calculus, opium is a most valuable remedy; it diminishes the sensibility of these parts, and prevents spasm:

furthermore, it relaxes the ureters, and thereby facilitates the passage of the calculus. In *inflammation of the gall ducts*, produced by a calculus, opium is likewise serviceable; but, as in the last-mentioned case, blood-letting and the warm bath should be employed simultaneously with it. In *inflammation of the mucous membranes*, attended with increased secretion, opium is a most valuable remedy. Thus, in *pulmonary catarrh*, when the first stage of the disease has passed by, and the mucous secretion is fully established, opium is frequently very beneficial: it diminishes the sensibility of the bronchial membrane to cold air, and thereby prevents cough. In severe forms of the disease, blood-letting ought to be premised. Given at the commencement of the disease, Dr. Holland (*op. supra cit.* p. 421) says, that twenty or thirty drops of laudanum will often arrest it altogether. In *diarrhœa*, opium, in mild cases, is often sufficient of itself to cure the disease: it diminishes the increased muscular contractions and increased sensibility (thereby relieving pain), and at the same time checks excessive secretion. Aromatics and chalk are advantageously combined with it. In violent cases blood-letting should precede or accompany it. *Mild* or *English cholera*, the disease which has been so long known in this country, and which consists in irritation or inflammation of the mucous lining of the stomach, is generally most successfully treated by the use of opium: two or three doses will, in slight cases, be sufficient to effect a cure. When opium fails, the hydrocyanic acid is occasionally most effective. In *dysentery*, opium can only be used beneficially in the latter stages, and then with great caution: it is best given in combination with either ipecacuanha or calomel. I have already stated that in *inflammation of the parenchymatous tissue of organs* the use of opium is less frequently beneficial, but often injurious. Thus in *inflammation of the cerebral substance* it is highly objectionable, since it increases the determination of blood to the head, and disposes to coma. In *peripneumonia* it is for the most part injurious; partly by its increasing the febrile symptoms, partly by its diminishing the bronchial secretion, and probably, also, by retarding the arterialization of the blood, and thereby increasing the general disorder of system. It must be admitted, however, that there are circumstances under which its use, in this disease, is justifiable. Thus, in acute peripneumonia, when blood-letting has been carried as far as the safety of the patient will admit, but without the subsidence of the disease, I have seen the repeated use of opium and calomel of essential service. Again: in the advanced stages of pneumonic inflammation, when the difficulty of breathing has abated, opium is sometimes beneficially employed to allay painful cough, and produce sleep. In *inflammation of the substance of the liver*, opium is seldom beneficial: it checks the excretion, if not the secretion, of bile, and increases costiveness. In *rheumatism*, opium frequently evinces its happiest effects. In acute forms of the disease it is given in combination with calomel, as recommended by Dr. R. Hamilton,—blood-letting being usually premised. From half a grain to two grains of opium should be given at a dose. Dr. Hope (*Lond. Med. Gaz.* xix. 815) recommends gr. vij. or gr. x. of calomel to be combined with each dose of opium. It is not necessary, or even proper, in ordinary cases, to affect the mouth by the calomel; though to this statement exceptions exist. The use of mercury may even, in some cases, be objectionable; and in such, Dover's powder will be found the best form of exhibition. This plan of treatment is well adapted for the diffuse or fibrous forms of acute rheumatism; but it does not prove equally successful in the synovial forms of the disease. It is also valuable in chronic rheumatism.

3. *In Diseases of the Brain and Spinal Cord.*—In some cerebro-spinal diseases great benefit arises from the use of opium; while in other cases injury only can result from its employment. The latter effect is to be expected in inflammation of the brain, and in apoplectic cases. In other words, in those cerebral maladies obviously connected with, or dependent on, an excited condition of the vascular system of the brain, opium acts injuriously. But there are many disordered conditions of the cerebro-spinal functions, the intensity of which bears no proportion to that of the derangement of the vascular system of the brain; and there are other deviations from the healthy functions in which no change in the cerebral circulation can be detected. In these cases opium or morphia frequently evinces its happiest effects. In *insanity* its value has been properly insisted on by Dr. Seymour, (*Lond. Med. Gaz.* vol. ix. p. 114; and *Med. Chir. Trans.* vol. xix. p. 167). He, as well as Messrs. Beverly and Phillips, employed the acetate of morphia. Its good effects were manifested rather in the low, desponding, or melancholic forms of the disease, than in the excited conditions. Opium is sometimes employed by drunkards to relieve *intoxication.* I knew a medical man addicted to drinking, and who, for many years, was accustomed to take a large dose of laudanum whenever he was intoxicated and was called to see a patient. On one occasion, being more than ordinarily inebriated, he swallowed an excessive dose of laudanum, and died in a few hours of apoplexy.

In *delirium tremens* the efficacy of opium is almost universally admitted. Its effects, however, require to be carefully watched; for large doses of it, frequently repeated, sometimes hasten coma and other bad symptoms. If there be much fever, or evident marks of determination of blood to the head, it should be used with great caution, and ought to be preceded by loss of blood, cold applications to the head, and other antiphlogistic measures. Though opium is to be looked on as a chief remedy in this disease, yet it is not to be regarded as a specific. Dr. Law (*Lond. Med. Gaz.* xviii. 538 and 694) speaks in high terms of its association with emetic tartar. I have before noticed the use of opium in alleviating some of the *cerebral symptoms which occur during fever.*

In *spasmodic and convulsive diseases* opium is a most important remedy. In *local spasms produced by topical irritants,* it is a most valuable agent, as I have already stated: for example, *in spasm of the gall ducts* or *of the ureters,* brought on by the presence of calculi; in *colic,* and in *painful spasmodic contractions of the bladder,* or *rectum,* or *uterus.* In *spasmodic stricture* opium is sometimes useful. In genuine *spasmodic asthma,* which probably depends on a spasmodic condition of the muscular fibres investing the bronchial tubes, a full dose of opium generally gives temporary relief; but the recurrence of the paroxysms is seldom influenced by opium. There are several reasons for believing that one effect of narcotics in dyspnœa is to diminish the necessity for respiration. Laennec (*Treat. on the Diseases of the Chest,* by Forbes, p. 77 and 99, 1827) states, that when given to relieve the extreme dyspnœa of mucous catarrh, it frequently produces a speedy but temporary cessation of the disease; and if we explore the respiration by the stethoscope, we find it the same as during the paroxysms,—a proof that the benefit obtained consists simply in a diminution of the necessity for respiration. That the necessities of the system for atmospheric air vary at different periods, and from different circumstances, is sufficiently established by the experiments of Dr. Prout (*Ann. of Phil.* ii. 330; and iv. 331); and it appears that they are diminished during sleep, at which time, according to Dr. Edwards (*De l'Infl. des Agens Physiq.* p. 321, 1824), the transpiration is increased. Moreover, the phenomena of hybernating aimals also bear on this point; for during their state of torpidity, or hybernation, their respiration is proportionally diminished.

In the *convulsive diseases* (*chorea*, *epilepsy*, and *tetanus*), opium has been used, but with variable success: in fact, the conditions of system under which these affections occur, may be, at different times, of an opposite nature; so that a remedy which is proper in one case is often improper in another. In *tetanus*, opium was at one time a favourite remedy, and is undoubtedly at times a remedy of considerable value. But it is remarkable that the susceptibility of the system to its influence is greatly diminished during tetanus. I have already (p. 37) referred to the enormous quantities which may, at this time, be taken with impunity. In 128 cases of tetanus noticed by Mr. Curling (*Treat. on Tetanus*, p. 151, 1836), opium in various forms, and in conjunction with other remedies, was employed in eighty-four cases; and of these, forty-five recovered. Notwithstanding, however, the confidence of the profession in its efficacy is greatly diminished.

Lastly, opium occasionally proves serviceable in several forms of *headache*, especially after loss of blood. I have seen it give great relief in some cases of what are commonly termed nervous headaches; while in others, with apparently the same indications, it has proved injurious. Chomel (*Lond. Med. Gaz.* vol. i. p. 156) applied, with good effect, opium cerate to a blistered surface of the scalp, to relieve headache.

4. *In Diseases of the Chest.*—In some affections of the heart and of the organs of respiration opium is beneficial. I have already alluded to its employment in *catarrh, peripneumonia*, and *spasmodic asthma*. In the first of these maladies caution is often requisite in its use. "In an aged person, for example, suffering under *chronic bronchitis* or *catarrhal influenza*—and gasping, it may, be under the difficulties of cough and expectoration—an opiate, by suspending these very struggles, may become the cause of danger and death. The effort here is needed for the recovery of free respiration; and if suppressed too long, mucus accumulates in the bronchial cells, its extrication thence becomes impossible, and breathing ceases altogether." (Holland, *op. supra cit.* p. 425).

5. *In Maladies of the Digestive Organs.*—I have already referred to the use of opium in *gastritis, enteritis, peritonitis, diarrhœa, dysentery, colic, the passage of gall-stones*, and *in hepatitis*. With respect to the use of opium *in hepatic affections*, I am disposed to think with Dr. Holland, that, with the exception of the painful passage of a gall-stone through the ducts, there is scarcely a complaint of the liver and its appendages "where opium may not be said to be hurtful, though occasionally and indirectly useful when combined with other means" (*op. supra cit.* p. 429). *In poisoning by acrid substances* opium is used with advantage to lessen the susceptibility of the alimentary canal, and thereby to diminish the violence of the operation of these local irritants. Cantharides, all the

drastic purgatives, when taken in excessive doses, (as elaterium, colocynth, gamboge, scammony, and croton oil or seeds) and *Arum maculatum*, may be mentioned as examples of the substances alluded to. Besides the above-mentioned beneficial operation, opium allays the spasmodic contractions of the bowels, relieves pain, and checks inordinate secretion and exhalation.

In poisoning by corrosives, (the strong mineral acids, and alkalies, for example), diminishing the sensibility of the alimentary canal by the use of opium, cannot, of course, alter the chemical influence of the poisons, yet it may prove useful by allaying the consequences of inflammation.

As meconic acid is said to be an antidote in cases of poisoning by corrosive sublimate, opium, in full doses, may perhaps be administered with some advantage, when other antidotes cannot be procured.

In poisoning by the preparations of arsenic, of lead, and of copper, opium is sometimes found useful.

6. *In Maladies of the Urino-genital apparatus* opium is a most valuable remedy. It mitigates pain, allays spasmodic action, checks copious mucous secretion, and diminishes irritation. Its use for one or more of these purposes in *nephritis*, *cystitis*, *the passage of urinary calculi*, and *spasmodic stricture*, has been already pointed out. *In irritable bladder* it is an invaluable remedy, especially in conjunction with liquor potassæ (see p. 279). *In irritation* and *various painful affections of the uterus*, and in *chordee*, the value of opium is well known. In the treatment of the *phosphatic diathesis* it is the only remedy that can be employed, according to Dr. Prout, to diminish the unnatural irritability of the system.

Of all remedies for that hitherto intractable malady, *diabetes*, opium has been found to give the most relief (see Prout, *Inq. into the Treat. of Diabetes*, &c. p. 74, 2nd ed. 1825). Under its use the specific gravity, saccharine quality, and quantity of urine, have been diminished. It has not, however, hitherto succeeded in permanently curing this disease. Dr. Prout has also found it serviceable when there is an *excess of urea in the urine* (*Ibid.* p. 54).

7. *As an anodyne.*—To relieve pain by dulling the sensibility of the body, opium is, of all substances, the most useful, and the most to be relied on for internal exhibition. We sometimes use it to alleviate the pain of inflammation, as already mentioned; to diminish spasm and the sensibility of the part in calculi of the gall ducts, in the ureters, and even when in the urinary bladder; to relieve pain in the various forms of scirrhus and carcinoma, in which diseases opium is our sheet anchor; to allay the pain arising from the presence of foreign bodies in wounds; to prevent or relieve after-pains; to diminish the pain of menstruation; and, lastly, as an anodyne in neuralgia. As a *benumber* or *topical anodyne* it is greatly inferior to aconite. Hence in neuralgia the latter is much more successful than opium. (See *Aconitum.*)

8. In *hemorrhages.*—Opium is at times serviceable to obviate certain *ill effects of hemorrhages*; as when there is great irritability attended with a small and frequent pulse, and also to relieve that painful throbbing about the head so often observed after large evacuations of blood. In or immediately after *uterine hemorrhage* the use of opium has been objected to, on the ground that it might prevent the contraction of the womb; but where the employment of opium is otherwise indicated, this theoretical objection deserves no weight. In *bronchial hemorrhage* it is at times a

valuable remedy, and may be associated with acetate of lead (notwithstanding the chemical objections to the mixture) with good effect.

9. *In mortification.*—When mortification is attended with excessive pain, opium is resorted to. In that kind of mortification called *gangræna senilis*, which commences without any visible cause, by a small purple spot on the toes, heels, or other parts of the extremities, and which sometimes arises from an ossified condition of the arteries, Mr. Pott (*Chir. Obs.* 1775) strongly recommended opium, in conjunction with a stimulating plan of treatment, and experience has fully proved its great efficacy.

10. *In venereal diseases.*—Opium is frequently employed in venereal diseases to prevent the action of mercurials on the bowels during salivation; also to allay the pain of certain venereal sores, and venereal diseases of the bones. By some it has in addition been employed as an anti-venereal remedy; and, according to Michaelis (*Med. Communications,* vol. i.) and others, with success. Moreover, it is stated by Dr. Ananian, who practised at Constantinople, that those persons who were in the habit of taking opium rarely contracted the venereal disease. But opium possesses no specific anti-venereal powers (Pearson, *Observ. on the Effects of various Art. of the Mat. Med. in Lues Ven.* p. 57. 1800). It has appeared to me, on several occasions, to promote the healing of venereal sores.

11. In various forms of *ulcers*, and in *granulating wounds*, the efficacy of opium has been satisfactorily established by Mr. Skey, (*On a new Method of Treatment employed in the Cure of various forms of Ulcer and Granulating Wounds.* Lond. 1837). Richter (*Comm. Soc. Scient. Gött.* vol. xv.) and others (see Ploucquet's *Lit. Med.* iv. 214, 1809), had already noticed its good effects; but their statements had attracted little attention. Mr. Grant (*Lond. Med. Journ.* vi. 5. and 130), in 1785, pointed out the efficacy of opium in the treatment of foul ulcers, attended with a bad discharge, and much pain. He ascribed these symptoms to "morbid irritability," which the opium removed. Its use is prejudicial in ulcers attended with inflammation, in the florid or sanguineous temperament, and in childhood. But in the chronic or callous ulcer, in the so-called varicose ulcer, in recent ulcers (from wounds) in which granulation proceeds slowly, or in other cases, the efficacy of opium, administered in small doses, (as ten drops of laudanum three times daily), is most manifest, especially in elderly persons, and in those whose constitutions have been debilitated by disease, labour, spirituous liquors, &c. It appears to promote the most genial warmth, to give energy to the extreme arteries, and thereby to maintain an equal balance of the circulation throughout every part of the body, and to animate the dormant energies of healthy action.

12. The *external application* of opium is comparatively but little resorted to, and for two reasons: in the first place, its topical effects are slight; and, secondly, its specific effects on the brain and general system are not readily produced through the skin. Aconite and belladonna greatly exceed opium in their topical effects. The following are some of the local uses of opium:—In *ophthalmia*, the wine of opium is dropped into the eye when there is excessive pain, (see *Vinum Opii*). In *painful and foul sores*, opiates are used with occasional good effects.

Mr. Grant (*op. supra cit.*) applied the tincture twice a-day, in an oatmeal poultice, to irritable sores. Opiate *frictions* have been employed as topical anodynes, and to affect the general system. Thus, in *chronic rheumatism and sprains*, the opium liniment proves a useful application. In *maniacal delirium*, as well as some other cerebral disorders, Mr. Ward (*Med. and Phys. Journ.* vol. i. p. 440, 1799) employed, with apparently beneficial effects, opiate frictions; for example, ℥ss. of opium, mixed with gr. iv. of camphor, ℈iv. of lard, and ʒj. of olive oil. In *neuralgic affections*, an opiate cerate, or finely powdered hydrochlorate of morphia applied to a blistered surface, occasionally gives relief. In *gastrodynia*, it may be applied in the same way to the epigastrium (Holland). In *gonorrhœa and gleet*, opiate injections have been used. In *spasmodic stricture, in diseases of the prostate gland*, and in *gonorrhœa to prevent chordee*, an opiate suppository is a useful form of employing opium, especially where it is apt to disagree with the stomach. In *nervous and spasmodic affections* (as some forms of asthma), the endermic application of opium or morphia, applied along the course of the spine, is often singularly beneficial, when all methods of depletion and counter-irritation have proved utterly unavailing (Holland). In *tooth-ache*, opium is applied to the hollow of a carious tooth. Dr. Bow (*Lancet*, March 18, 1837) speaks in the highest terms of the efficacy of the external application of opium *in inflammatory diseases*, but especially *bronchitis* and *croup*.

Administration.—Opium is given, *in substance*, in the form of pill, powder, lozenge, or electuary. The dose is subject to great variation, depending on the age and habits of the patient, the nature of the disease, and the particular object for which we wish to employ it. In a general way, we consider from an eighth of a grain to half a grain *a small dose* for an adult. We give it to this extent in persons unaccustomed to its use, when we require its stimulant effects, and in mild catarrhs and diarrhœas. From half a grain to two grains we term *a medium dose*, and employ it in this quantity as an ordinary anodyne and soporific. From two to five grains we denominate *a full* or *large dose*, and give it to relieve excessive pain, violent spasm, in some inflammatory diseases after blood-letting, in tetanus, &c. These are by no means to be regarded as the limits of the use of opium. *Opium pills (pilulæ opii)* may be prepared either with crude or powdered opium. The latter has the advantage of a more speedy operation, in consequence of its more ready solution in the gastric liquor. Employed as *a suppository*, opium is used in larger doses than when given by the stomach. Five grains, made into a cylindrical mass with soap, may be introduced into the rectum, to allay irritation in the urino-genital organs.

In noticing the preparations of the poppy employed in medicine, I shall arrange them under three heads:—1st, Preparations of the poppy heads; 2ndly, Of opium; 3rdly, Of morphia, and its preparations.

a. *Preparations of Poppy Heads.*

1. *Decoctum Papaveris*, L. E. D. *Poppy Fomentation.* (Poppy-heads, sliced, ℥iv; Water, Oiv. [Oiij *E.*; Oij *D*]. Boil for a quarter of an hour, and strain). The seeds contribute, by their oleaginous properties, to the emollient quality of the decoction. This preparation forms a common fomentation, which is applied to bruised, inflamed, excoriated, tender, or

swollen parts; to the eye in ophthalmia, to the abdomen in enteritis, peritonitis, &c. to tender ulcers, &c. In cancer and other painful affections of the uterus, it is thrown into the vagina as a soothing remedy.

2. *Syrupus Papaveris*, L. E. D. *Syrup of White Poppies.* (Poppy heads [without the seeds, *E.*; dried, bruised, and deprived of seeds, *D.*] lb. iij. [lb. iss. *E.* ℥xvij. *D.*]; Sugar [pure *E. D.*], lb. v. [lb. iij. *E.* ℥xxix. *D.*]; Boiling Water, *Cong.* v. [Oxv. *E. Cong.* ii. *D*]. Boil down the capsules in the water to two gallons, [Ov. *E. Cong.* j. *D*], and strongly express the liquor while hot [through calico, *E*]. Boil down the strained liquor to four pints [Oijss, *E.* Oij. *D*]; [and filter while hot. Set it by for 12 hours that the dregs may subside; then boil down the clear liquor to two pints, *L.*; one pint, *D*], add the sugar and dissolve it [with the aid of heat, *E.*])—Syrup of poppies, especially if too thin, is very liable to ferment; and then contains spirit or acetic acid, or both, and is of course ill adapted for medicinal use. To check these changes, it should be carefully made according to the directions of the College, taking care that it has the proper consistence, and keeping it in a cool place. Occasionally a mixture of treacle and laudanum, or of syrup and extract of poppies, has been substituted; but this fraud is highly dangerous, and has on several occasions proved fatal to children, (See the cases referred to by Dr. Montgomery, in his *Obs. on the Dubl. Pharm.* 472). Syrup of poppies is narcotic, sedative, and anodyne, and is commonly employed as the infant's opiate. It mitigates pain, allays spasm and troublesome cough, and promotes sleep. Even in the adult it is sometimes used for these purposes. It forms a useful adjunct to pectoral tinctures. Over ordinary opiates it has the positive advantage of a less disagreeable taste, and the supposed one of being less likely to create nausea and headache. Even when properly prepared its administration to infants requires the greatest caution, on account of their known susceptibility to the influence of opiates. "I have been informed," says Dr. Montgomery, "of more than one instance in which a tea-spoonful has been known to prove fatal to a healthy child." The dose of it, for an infant of three or four months old, is f℥ss.; for adults from f℥ij. to f℥iv.

3. *Extractum Papaveris*, L. E. (Poppy-heads, without the seeds, bruised, ℥xv.; Boiling [distilled, *L.*] Water, *Cong.* j.; Macerate for twenty-four hours; then boil down to four pints, and filter the liquor while hot: lastly, evaporate to a proper consistence, [by the vapour-bath, *E*]). Anodyne and soporific. It appears to me to produce effects similar to those of opium, for which it is frequently substituted, on the supposition that, while it allays pain and promotes sleep, it is less liable to occasion nausea, constipation, headache, or delirium. If it be prepared from a decoction, instead of an infusion of the poppy-heads as directed in the pharmacopœias, it will contain a considerable quantity of inert mucilaginous matter. Dose, gr. ij. to ℈j.

b. *Preparations of Opium.*

1. *Pilulæ Opii sive Thebaicæ*, E. (Opium, gr. xxiv.; Sulphate of Potass, gr. lxxii.; Conserve of Red Roses, gr. xxiv.: beat them into a proper mass, which is to be divided into twenty-four pills.—It is to be observed, that this pill contains twice as much opium as the opiate pill of the last edition of this pharmacopœia). Employed as an anodyne and soporific. Dose, one or two pills (*i. e.* gr. v. to gr. x). The sulphate of

potash serves to divide the opium. One pill or five grains contains one grain of opium.

2. *Pilulæ Saponis compositæ*, L. *Pilulæ Saponis cum Opio*, D. (Hard Opium, powdered, ℥ss.; Hard Soap, ℥ij. Beat them together until incorporated).—Employed as an anodyne and soporific. Dose, gr. iii. to gr. x. Five grains contain one grain of opium. The soap enables the pills to dissolve readily in the juices of the stomach. From gr. v. to ℈j. are sometimes used as a suppository.

3. *Pilulæ Calomelanos et Opii*, E. *Calomel and Opium pills.* (Calomel, gr. xxiv.; Opium, gr. viij.; Conserve of Red Roses, a sufficiency; beat them into a proper mass, which is to be divided into twelve pills).—Each pill contains two grains of calomel and two-thirds of a grain of opium. A valuable compound in rheumatism and various other inflammatory diseases. Dose, one or two pills.

4. *Pilulæ Plumbi Opiatæ*, E. (Acetate of Lead, gr. lxxii.; Opium, gr. xij.; Conserve of Red Roses, about gr. xiv. Beat them into a proper mass, which is to be divided into twenty-four pills.—This pill may be made also with twice the quantity of opium). I have already (see p. 518) stated, that notwithstanding a mutual decomposition is effected between acetate of lead and opium, the resulting compound is a most efficacious one. The Edinburgh College, therefore, has done wisely in countenancing the combination, but the permission to vary the strength of the pill is highly objectionable. In hæmoptysis, profuse secretion of bronchial mucus, obstinate diarrhœa, and dysentery, its effects are most valuable. Dose, one to three pills. Each pill contains three grains of acetate of lead, and half a grain (or one grain) of opium.

5. *Trochisci Opii*, E. *Opium Lozenges.* (Opium, ʒij.; Tincture of Tolu, ℥ss; Syrup, f℥viij.; Powder of Gum-Arabic, and Extract of Liquorice, softened with boiling water, of each ℥v. Triturate the Opium with the Tincture of Tolu, add gradually the Syrup and Extract, then sprinkle the gum by degrees into the mixture, and beat the whole into a proper mass, which, when sufficiently dried, is to be divided into lozenges of ten grains).—In London the manufacture of lozenges is practised as a distinct trade. The opium lozenges of the shops usually contain each about one-eighth of a grain of opium; those of the Edinburgh Pharmacopœia about one-seventh of a grain. Lozenge-makers substitute powdered sugar for the syrup of the pharmacopœia, and employ a much smaller proportion of gum. The tincture of Tolu which they use is much more concentrated than that of the shops, the spirit of which is objectionable. Opium lozenges are used to allay troublesome cough.

6. *Pulvis Cretæ compositus cum Opio*, L. D. *Pulvis Cretæ opiatus*, E.—(Compound Powder of Chalk, ℥vjss. [℥vj. *E*]; Powder of hard Opium, ℈iv. Triturate them together thoroughly—Astringent and narcotic. Employed in diarrhœa. Dose for adults, ℈j. to ℈ij.; for children, gr. ij. to gr. x. according to their age. Forty grains of this powder, prepared according to the London or Dublin Pharmacopœias, or thirty-seven of the Edinburgh Pharmacopœia, contain one grain of opium.

7. *Confectio Opii*, L. D. *Electuarium Opii*, *D.* (Hard Opium, powdered, ʒvj.; Long Pepper, ℥j.; Ginger, ℥ij.; Caraway, ℥iij.; Tragacanth, powdered, ʒij.; Syrup, f℥xvj. [lb. j. *D.*] Rub the opium with the syrup previously heated, then add the other ingredients in powder, and mix, *D.*—The *London College* directs the dry ingredients to be kept

mixed in the form of a very fine powder, and the syrup to be added when the confection is to be used. The *Edinburgh College* adopts the following formula:—"Aromatic Powder, ℥vj.; Senega, in fine powder, ℥iij; Opium diffused in a little Sherry, ℥ss.; Syrup of Ginger, lb. j. Mix them together, and beat into an electuary"). Aromatic and narcotic. Employed in flatulent colic and diarrhœa; in the latter complaint usually as an adjunct to the chalk mixture. Dose, gr. x. to ʒj.—The *Dublin* preparation contains gr. j. of opium in about twenty-five grains of confection. The *London* preparation is somewhat weaker, and contains gr. j. of opium in perhaps thirty-six grains. The *Edinburgh* preparation is still weaker; forty-three grains of it containing about one grain of opium.

8. *Emplastrum Opii*, L. E. D. (Hard Opium, powdered, ℥ss.; Resin of the Spruce Fir, powdered, ℥iij.; Plaster of Lead, lb. j.; Water, f℥viij. Add the Resin of the Spruce Fir, the Opium, and the Water, to the melted Plaster, and with a slow fire boil down until all unite into a proper consistence, *L.*—The *Edinburgh and Dublin Colleges* omit the water, and, for the Resin of the Spruce Fir, substitute Burgundy Pitch). Employed as a topical anodyne in rheumatism, lumbago, and neuralgia. Its powers are very slight, or even equivocal.

9. *Extractum Opii purificatum*, L. *Extractum Opii*, E. *Extractum Opii aquosum*, D. (Opium sliced, ℥xx. [Oj. *E.*; ℥ij. *D.*]; Water [distilled, *L.*; boiling, *D.*], *Cong.* j. [Ov. *E.*; Oj. *D.*] Add a little water to the opium, and macerate for twelve hours, that it may soften; then, the remaining water being poured in gradually, rub them until they are very well mixed, and set by, that the dregs may subside; afterwards strain the liquor, and evaporate to a proper consistence, *L.*—The *Edinburgh College* digests five times, in successive pints of water, and for twenty-four hours each time. The evaporation is directed to be effected by a vapour-bath.—The *Dublin College* exposes the infusion to the air for two days before evaporation). When opium is digested in water, this fluid takes up the *odorous principle*, the *salts of morphia and codeia*, the *narcotina*, the *gum*, the *extractive*, and some of the *resin*. A portion of morphia is frequently found in the dregs. Moreover, a portion of the *oil* is found in the solution. By concentration, the odorous principle is dissipated, and the resin and the oil combined with, and in part saturating the narcotina, are separated. These matters would be more completely got rid of by re-dissolving the extract in water. The removal of these inert principles, as well as the impurities of opium and the consequent concentration of the active constituents of this substance, must, of course, render the extract a more powerful preparation than ordinary opium. Good opium yields more than half its weight (from 60 to 70 per cent.) of extract, which, therefore, should be at least one-third more active than crude opium. It is usually believed to operate with less disturbance to the general system than the ordinary preparations of opium. It is employed as an anodyne, sedative, and soporific, in cases where crude opium or its tincture disagrees. The dose of it is from gr. ¼ to gr. iij. or gr. iv.

Mr. Battley, some years since, assured me that the only ingredients employed in the preparation of his *liquor opii sedativus* were opium, water, and heat. It appears to contain somewhat less meconic acid than the ordinary tincture of opium. Probably this and some other principles of opium are got rid of by successive evaporations and solutions. Perhaps an aqueous solution of the watery extract of opium, with the addition of a little spirit to preserve it, would be a convenient substitute.

10. *Tinctura Opii*, L. E. D. *Laudanum.* (Hard Opium, powdered, ℥iij.; Proof* Spirit, Oij. Macerate for fourteen days, and filter, *L.*—The proportions used by the *Dublin College* are ℥x. of Opium and Oj. [wine measure] of spirit. The *Edinburgh College* directs—"Opium sliced, ℥iij.; Rectified Spirit, Oj. and f℥vij.; Water, f℥xiijss. Digest the opium in the water at a temperature near 212° for two hours; break down the opium with the hand; strain and express the infusion; macerate the residuum in the rectified spirit for about twenty hours, and then strain and express very strongly. Mix the watery and spirituous infusions, and filter.—This tincture is not easily obtained by the process of percolation; but when the opium is of fine quality, it may be prepared thus:—Slice the opium finely; mix the spirit and water; let the opium macerate in fourteen fluidounces of the mixture for twelve hours, and then break it down thoroughly with the hand; pour the whole pulpy mass and fluid into a percolator, and let the fluid part pass through, add the rest of the spirit without packing the opium in the cylinder, and continue the process of percolation till two pints are obtained," *E.*)—The percolation process of the Edinburgh College is unnecessary and troublesome, and will, I suspect, be rarely, if ever, adopted by laudanum preparers. Tincture of opium is of a deep brownish-red colour, with the peculiar odour and taste of opium. Its sp. gr., according to Mr. Phillips (*Transl. of the Pharm.*), is 0·952. Nineteen minims of it contain about one grain of opium. Proof spirit dissolves the same constituents as water does (see p. 1311), but it takes up a larger proportion of narcotina, resin, and oil. I have repeatedly prepared morphia from the insoluble residue left behind in the preparation of the tincture. Tincture of opium is a powerful and valuable anodyne and soporific. Its employment is to be preferred to that of solid opium where a more immediate effect is required. Moreover, in administering opiates to children, the facility of adjusting small doses of it presents a great advantage over solid opium. The dose of it, like that of solid opium, must vary according to several circumstances. For an adult it varies from ♏x. to fℨj. To children it must be given with the greatest caution. I have seen a powerful effect produced in a very young infant by one drop.

11. *Enema Opii*, L. D. *Enema Opii* vel *Anodynum*, E. *Opium Clyster.*—(Decoction of Starch, f℥iv.; Tincture of Opium, ♏xxx. Mix, *L.*—The *Dublin College* employs ℥vi. of water instead of the Starch Mucilage, and ℨj. of Tincture of Opium.—The *Edinburgh College* uses ℨss. of Starch; fℨss. to fℨj. of Tincture of Opium; and f℥ij. of Water. The starch is boiled in the water, and the tincture added when the mucilage is cool enough for use.)—The formula of the London College is, in my opinion, to be preferred to those of the other British colleges; but it may be sometimes necessary to double or treble the quantity of tincture employed. In the passage of renal calculi, in nephritis, irritation or inflammation of the bladder, uterus, or prostate gland, in dysentery, and painful affections of the large intestine, the opium clyster is most valuable.

12. *Linimentum Opii*, L. E.—(Soap Liniment, f℥vj.; Tincture of Opium, f℥ij. Mix.) Employed as an anodyne in rheumatism, neuralgic pains, sprains, &c.

* The London Pharmacopœia erroneously directs *rectified* spirit.

13. *Vinum Opii*, L. E. D. *Laudanum Liquidum Sydenhami*, Ph. L. 1720. *Tinctura Thebaica*, Ph. L. 1745. (Opium [Purified Extract of Opium, *L.*], ℥j. [℥iss. *L.*]; Cinnamon, bruised; Cloves, bruised, of each, ʒiss. [ʒj. *E.*; ʒss. *D.*]; Sherry Wine, Oij. [℥xviiss. *E.*; Oj. *wine measure*, *D.*] Macerate for fourteen [seven, *E.*; eight, *D.*] days, and filter).—Its effects are similar to those of the tincture of opium, but its taste and smell are more agreeable. It was recommended by Mr. Ware (*Remarks on Ophthalmy*, p. 29, 1780) as an application to the eye in ophthalmia; and experience has fully proved its efficacy where there is much scalding pain, lachrymation, and intolerance of light. When first applied it causes a sharp pain and a copious flow of tears, but these effects soon subside, and are followed by a considerable abatement of the former sufferings. For internal use the dose is gtt. x. to fʒj.

14. *Tinctura Opii Ammoniata*, E.—("Benzoic Acid; and Saffron, chopped, ʒiij. of each; Opium sliced, ʒij.; Oil of Anise, ʒss.; Spirit of Ammonia, Oj.; Digest for seven days, and filter").—Employed as a powerful diffusible stimulant and antispasmodic in hooping-cough and other spasmodic affections. Each drachm and a quarter contains about a grain of opium. Dose, fʒss. to fʒj.

15. *Acetum Opii*, E. D. *Vinegar of Opium*. (Opium, ℥iv.; Distilled Vinegar, f℥xvj. "Cut the Opium into small fragments, triturate it into a pulp with a little of the vinegar, add the rest of the vinegar, macerate in a closed vessel for seven days, and agitate occasionally. Then strain and express strongly, and filter the liquors"). Vinegar dissolves all the principles of opium soluble in water, and is better adapted for holding in solution the narcotina and the resinous matter of opium. It cannot, of course, effect any change in the sulphate of morphia contained in opium. Whether any acetate of morphia is formed at the expense of the meconate of morphia has not been satisfactorily proved. The effects of vinegar of opium do not appear to be precisely those of ordinary opium. It is believed to possess the anodyne, sedative, and soporific qualities of opium, without being apt to excite the disagreeable effects (nausea, headache, constipation, and general disorder of system) which sometimes result from the ordinary preparation of this drug. Hill (*Hist. of the Mat. Med.* p. 784, 1751) says that Le Mort observed a very odd effect from this preparation, "which was, that it often brought on suppressions of urine." Dr. Montgomery (*Observ. on the Dubl. Pharm.* p. 451, 1430) has seen one instance of this effect; and Dr. Thos. Beattie (*Dubl. Hosp. Rep.* vol. v. p. 185) has remarked the same result from the *Black Drop*. This paralyzing effect on the bladder is doubtless referrible to the morphia, which seems to acquire, in this preparation, increased activity. Vinegar of opium is employed as an anodyne, sedative, and soporific. Dr. Montgomery observes, that he has found this preparation of opium decidedly superior to every other in relieving the agony of cancer uteri, and procuring rest at night."—The same authority states, that twenty drops are equivalent to thirty of the common tincture of opium. Dose, gtt. vi. to gtt. xxx.

Acetum Opii may be regarded as the officinal substitute for a celebrated quack medicine called the *Black Drop*, or *The Lancaster* or *Quakers' Black Drop*, the method of preparing which has been described by the late Dr. Armstrong. In this preparation *verjuice* (juice of the wild crab) is employed instead of vinegar. But there are several sources of uncertainty in the process.

Dr. Porter's *solution of opium in citric acid* has never come into general use.

16. *Unguentum Gallæ compositum.* See p. 737.
17. *Tinctura Camphoræ composita.* See p. 797.
18. *Pilulæ Styracis compositæ.* See p. 934.
19. *Pulvis Ipecacuanhæ compositus.* See p. 1024.
20. *Pilulæ Ipecacuanhæ compositæ*, L. (Compound Powder of Ipecacuanha, ℥iij.; Squills, recently dried; Ammoniacum, of each, ℥j.; Mixture of Acacia, q. s. Beat them together until they are incorporated).—Narcotic, sudorific. Employed in chronic mucous catarrh, &c. Dose gr. v. to gr. x.—The formula for the *Pilulæ Ipecacuanhæ et Opii*, Ph. Ed. has already been given. (See p. 1025).
21. *Pulvis Kino compositus.* See p. 1145.
22. *Electuarium Catechu.* See p. 1157.

c. *Morphia and its Preparations.*

1. *Morphia*, L.—The following are the directions for preparing morphia, given in the London Pharmacopœia:—

Take of Hydrochlorate of Morphia, ℥j.; Solution of Ammonia, f℥v.; Distilled Water, Oj. Add the Hydrochlorate of Morphia, first dissolved in a pint of water, to the solution of Ammonia with an ounce of water, shaking them together. What is thrown down wash with distilled water, and dry it with a gentle heat.

In this process the ammonia unites with the hydrochloric acid, and the morphia being set free is precipitated.

The physical and chemical properties of this substance have been already (p. 1281) described. The following characters of morphia are given in the pharmacopœia.

Very little soluble in cold water, little in boiling water, but very readily in alcohol. This solution exhibits alkaline properties when tried with turmeric; and, when the spirit is distilled from it, it yields crystals, which are totally destroyed by heat. On the addition of nitric acid, morphia becomes first red, and afterwards yellow. Tincture of sesquichloride of iron gives it a blue colour. Chlorine and [afterwards] ammonia being added to its salts, they are rendered of a brown colour, which is destroyed when more chlorine is added. Morphia is also precipitated from its salts by solution of potash, which added in excess re-dissolves it.

2. *Morphiæ Acetas*, L. E.—This salt is thus directed to be prepared by the *London College*:—

Take of Morphia, ℨvj.; Acetic Acid, f℥iij.; Distilled Water, f℥iv. Mix the Acid with the water, and pour them upon the morphia to saturation. Let the liquor evaporate with a gentle heat, that crystals may be formed.

In this process the acetic acid saturates the morphia, and the solution by evaporation yields crystallized acetate of morphia.

The following are the directions of the *Edinburgh College*:—

"Take muriate of morphia, any convenient quantity. Dissolve it in fourteen times its weight of warm water, and, when the solution is cool, add aqua ammoniæ gradually, and with constant agitation, until there is a permanent but faint odour of ammonia in the fluid. Collect the precipitate on a calico filter, wash it moderately with cold water, and dissolve it by means of a slight excess of pyroligneous acid, in twelve parts of warm water for every part of muriate of morphia that was used. Concentrate the solution over the vapour-bath, and set aside to crystallize. Drain and squeeze the crystals, and dry them with a gentle heat. More acetate of morphia may be obtained on concentrating the mother liquor."

In this process the ammonia decomposes the muriate of morphia and the precipitated morphia is afterwards dissolved in diluted pyroligneous (acetic) acid.

Acetate of morphia is usually prepared by evaporating its solution to dryness by a gentle heat. Obtained in this way it is amorphous. It is difficult to obtain pure, as it readily undergoes decomposition, when its solution is evaporated, and is converted into a mixture of morphia, neutral acetate, and the super-acetate of morphia. Hence, as met with in commerce, it is imperfectly soluble in water, unless a few drops of acetic acid be added. It is usually slightly coloured. Its crystals, when pure, are colourless and radiating. The following is the composition of this salt:—

	Atoms.	Eq. Wt.	Per Cent.
Morphia	1	292	82·95
Acetic acid	1	51	14·5
Water	1	9	2·55
Acetate of Morphia	1	352	100·00

Crystallized acetate of morphia is,—

Very readily dissolved in water. Its other properties are such as have been stated of morphia.—*Ph. L.*

It is less soluble in alcohol than in water.

The *Edinburgh College* gives the following characters of the purity of this salt:—

One hundred measures of a solution of ten grains in half a fluid ounce of water and five minims of acetic acid, heated to 212°, and decomposed by a faint excess of ammonia, yields by agitation a precipitate which, in twenty-four hours, occupies 15·5 measures of the liquid.

3. *Morphiæ Hydrochloras*, L. *Morphiæ Murias.* In the *London Pharmacopœia* this salt is directed to be prepared as follows:—

Take of Opium, sliced, lb. j.; Crystals of Chloride of Lead, ℥ij., or as much as may be sufficient; Purified Animal Charcoal, ℥iijss.; Hydrochloric Acid; Distilled Water; Solution of Ammonia, each as much as may be sufficient. Macerate the opium in four pints of distilled water for thirty hours, and bruise it; afterwards digest for twenty hours more, and press it. Macerate what remains again, and a third time, in water, that it may become free from taste, and as often bruise and press it. Evaporate the mixed liquors, with a heat of 140°, to the consistence of a syrup. Then add three pints of distilled water, and, when all the impurities have subsided, pour off the supernatant liquor. Gradually add to this two ounces of chloride of lead, or as much as may be sufficient, first dissolved in four pints of boiling distilled water, till nothing further is precipitated. Pour off the liquor, and wash what remains frequently with distilled water. Then evaporate the mixed liquors as before, with a gentle heat, that crystals may be formed. Press these in a cloth, then dissolve them in a pint of distilled water, and digest, with an ounce and a half of animal charcoal, in a heat of 120°, and strain. Finally, the charcoal being washed, evaporate the liquors cautiously, that pure crystals may be produced. To the liquor poured off from the crystals first separated, previously mixed with a pint of water, gradually drop in as much solution of ammonia, frequently shaking it, as may be sufficient to precipitate all the morphia. To this, washed with distilled water, add hydrochloric acid, that it may be saturated: afterwards digest it with two ounces of animal charcoal, and strain. Lastly, the animal charcoal being thoroughly washed, evaporate the liquors cautiously, that pure crystals may be produced."

Water extracts from opium the *meconate and sulphate of morphia and codeia;* a part of the *narcotin*, of the *meconine*, of the *narceine*, and of the *thebaina;* the brown acid *extractive;* and a part of the *resin*, and of the *fat oil.* When chloride of lead is added to infusion of opium, meconate, with a little sulphate of lead, and some resinous colouring matter, are precipitated, while the hydrochlorates of morphia and of codeia are left in solution. A solution of the impure crystals is then decomposed by ammonia, by which the morphia is precipitated, while codeia and hydro-chlorate of ammonia are left in solution. The morphia is dissolved in hydrochloric acid, and the solution of the hydrochlorate decolorized by charcoal.

The *Edinburgh College* follows Gregory's process. Their directions for preparing this salt are as follows:—

"Take of Opium, ℥xx.; Water Oviij.; Muriate of Lime, ℥j. or a slight excess.—Macerate the opium in fragments for twenty-four hours in two pints of water, and separate the infusion, squeezing well the residue. Repeat the maceration successively with two pints more of the water till the whole is made use of. Concentrate the whole infusions over the vapour-bath to the consistence of thick extract; which is to be dissolved as far as possible in warm water. Decant the clear liquid, boil it, and add the muriate of lime dissolved in four fluidounces of water. Set the whole aside to settle; pour off the liquid; wash the sediment with a little water, adding the washings to the liquid. Evaporate the liquid sufficiently in the vapour-bath for it to solidify on cooling. Subject the cooled mass to a very strong pressure in a cloth; redissolve the cake in a sufficiency of warm distilled water; add a little powder of white marble, and filter; acidulate the filtered fluid with a very little muriatic acid; and concentrate a second time in the vapour-bath for crystallization. Subject the crystals again to very strong pressure in a cloth. Repeat the process of solution, clarification by marble and muriatic acid, concentration, and crystallization, until a snow-white mass be obtained.

"On the small scale, trouble and loss are saved by decolorizing the solution of muriate of morphia by means of a little purified animal charcoal after two crystallizations. But on the large scale it is better to purify the salt by repeated crystallizations alone, and to treat all the expressed fluids, except the first, in the same way with the original solution of impure muriate of morphia. An additional quantity of salt may often be got from the first dark and resinous fluid obtained by expression, on merely allowing it to remain at rest for a few months, when a little muriate of morphia may be deposited in an impure condition.

"The opium which yields the largest quantity of precipitate by carbonate of soda according to the formula in p. 27 [p. 1288], yields muriate of morphia not only in greatest proportion, but likewise with the fewest crystallizations."

In this process the changes are analogous to those before described for the process of the London Pharmacopœia, except that meconate and sulphate of lime, instead of meconate and sulphate of lead, are produced.

Pure hydrochlorate of morphia crystallizes in plumose, acicular crystals. It is colourless, odourless, bitter, soluble in from 16 to 2[illegible] parts of cold water, but less of boiling water. When its saturated boiling solution is allowed to cool, it congeals to form a crystalline mass. It is soluble in alcohol. By heat it is decomposed and totally dissipated. Nitric acid reddens it. Sesquichloride of iron with an alkali colours it blue.

The air-dried crystals are thus composed:—

	Atoms.	*Eq. Wt.*	*Per Cent.*
Morphia	1	292	76·24
Hydrochloric acid	1	37	9·66
Water	6	54	14·10
Crystallized Hydrochlorate of Morphia	1	383	100·00

According to the *London College*, crystallized hydrochlorate of morphia should be,—

Soluble in water. What is precipitated [i. e. *chloride of silver*] from the solution by nitrate of silver, is not totally dissolved either by ammonia, unless added in excess, or by hydrochloric or nitric acid.

The *Edinburgh College* gives the following characters of its purity:—

"Snow white; entirely soluble; solution colourless; loss of weight at 212° not above 13 per cent.; one hundred measures of a solution of 10 grains in half a fluid ounce of water heated near to 212°, and decomposed with agitation by a faint excess of ammonia, yield a precipitate which, in twenty-four hours, occupies 12·5 measures of the liquid."

On the above I would merely observe, that Mr. Sandall (*Lond. Med. Gaz.* xxii. 186,) found that the quantity of water which this salt loses by drying varies from 9·20 to 14·33 per cent.

SULPHATE OF MORPHIA, though not contained in the British pharmacopœias, is occasionally used in medicine. It is crystalline, and readily soluble in water. It consists of 1 atom *sulphuric acid* = 40, 1 atom *morphia* = 292, and 6 atoms *water* = 54. One of these atoms of water is an essential constituent of the salt, and cannot be removed without destroying the salt. The other 5 atoms are the water of crystallization.

Physiological Effects of Morphia and its Salts.—The precise relation which the effects of this alkaloid and its salts bear to those of opium is a point on which the profession is by no means agreed. Some recent writers (Trousseau and Pidoux, *Traité de Thérap.* i. 164. 1836) declare that, after having carefully compared the effects of the morphia salts with those of opium, they can discover no difference between them; but my own limited observations of the effects of these salts induce me to agree with those who admit the similarity, but not the identity, of the effects of these substances. Charvet (*De l'Action Comp. de l'Opium*, 1826) could observe no difference between them in their action on the *invertebrata*. But on the higher classes of the *vertebrata* there were obvious differences. The effects of morphia on *man* are in several respects different from those of opium, but they appear to want uniformity; that is, the same results have not been arrived at by different experimenters. This may, in some cases at least, be ascribed to the employment of morphia contaminated with some other principles of opium. *In small doses*, as from a quarter of a grain to one grain, acetate of morphia causes a feeling of distension or fulness about the head, some disturbance of vision, oftentimes headache, giddiness, and somnolency or actual sleep, which, however, differs from ordinary sleep, and is often more or less disturbed. The pupils are usually contracted. Orfila says this occurs in nineteen out of twenty cases. However, in some instances dilatation has been observed, and in others the pupil was natural. The pulse is generally slow and small, though sometimes it is more frequent, and occasionally is soft and full. Itching of the skin is frequently noticed, or even a cutaneous eruption is by no means uncommon. Grain doses readily excite gastric uneasiness, nausea, and vomiting. One remarkable symptom often caused by acetate of morphia, especially in men, is a difficulty in voiding the urine, and which appears to depend on a weakened or paralytic condition of the bladder. Bally (*Mém. de l'Acad. Roy. de Méd.* i. 99) lays great stress on this last-mentioned symptom, especially when a full dose of morphia has been taken. When these effects subside, loss of appetite, muscular feebleness, and constipation, are left behind. When the dose is increased, the effects become somewhat alarming. Great cerebral excitement is produced, vision is disordered and obscured, there is singing in the ears, and the patient, when lying horizontally, experiences sudden convulsive movements, like those produced by the electric shock. When a fatal dose has been swallowed, the stomach sometimes manifests irritation, but this is soon followed by great disorder of the cerebro-spinal system, which ultimately assumes an apoplectic character. The sight becomes dim, excessive weakness is experienced, gradually all consciousness is lost, and coma supervenes, attended usually with contracted, though sometimes with dilated pupils, coldness of the surface, frequent and small pulse, hurried stertorous respiration, and occasionally with convulsions. Before insensibility comes on, as well as when it is subsiding, there is itching of the skin. Difficulty in passing the water is also experienced, in consequence of the paralysed state of the bladder. Not unfrequently, lividity of skin is observed.

The effects of morphia and its salts appear to be identical in their nature. The soluble salts (as the hydrochlorates) are more constant and certain in their operation than uncombined morphia, in consequence probably of the difficult solubility of the latter.

In comparing the morphitic salts with opium, we observe that they are less stimulant, and less disposed to cause sweating, constipation, headache, and dryness of the tongue. The feelings which they excite are less agreeable, and hence they are not adapted to be substituted for opium by the eaters of this drug. They more readily affect the bladder than opium.

Uses.—We employ morphia or its salts in preference to opium when our object is to make applications to the denuded dermis, (*endermic medication*, see p. 49). They are employed in this way for the purpose of alleviating violent neuralgic pains; and to relieve the excessive endermic operation of strychnia (see p. 921). Gastrodynia and obstinate vomiting are sometimes relieved by the endermic application of morphia to the epigastrium; and violent headache by the application of this remedy to the temples. Occasionally this mode of administration is adopted, when we wish to bring the general system under the calming and sedative influence of morphia, and where from some cause its exhibition by the mouth is objectionable. Some cases of maniacal delirium may be treated with advantage this way.

The morphia salts are given internally in cases where we wish to obtain the anodyne, soothing, sedative, soporific, and antispasmodic qualities of opium, and where this drug is objectionable on account of its tendency to excite certain injurious effects already referred to (see p. 1313). In all cases where both opium and the morphia salts are equally admissible, I prefer the former, its effects being better known and regulated; moreover, opium is to be preferred as a stimulant and sudorific, and for suppressing excessive mucous discharges.

Administration.—The salts of morphia are given internally, in substance or solution, in doses of from one-eighth to one-fourth of a grain. For endermic use they are to be finely powdered, and applied to the extent of a grain or a grain and a half at a time.

4. *Morphiæ Muriatis Solutio*, E. ("Muriate of Morphia, ʒiss.; Rectified Spirit, f℥v.; Distilled Water, f℥xv.; Mix the Spirit and Water and dissolve the muriate of morphia in the mixture with the aid of gentle heat").—166½ minims of this solution contain one grain of muriate of morphia. The dose is from ♏x. gradually increased to fʒss.

5. *Trochisci Morphiæ*, E. *Morphia Lozenges.* (Muriate of Morphia, ℈j.; Tincture of Tolu, ℥ss.; Pure Sugar, ℥xxv. Dissolve the muriate of morphia in a little hot water; mix it and the tincture of Tolu with the sugar; and, with a sufficiency of mucilage, form a proper mass for making lozenges; each of which should weigh, about fifteen grains. Each lozenge contains about one-fortieth of a grain of muriate of morphia.

The morphia lozenges of the shops usually contain each one-twenty-fourth of a grain of muriate of morphia.—This is an agreeable mode of employing morphia, especially in pectoral affections.

6. Trochisci Morphiæ et Ipecacuanhæ, E. *Morphia and Ipecacuanha Lozenges.* (Muriate of Morphia, ℈j.; Ipecacuan, in fine powder, ʒj.; Tincture of Tolu, f℥ss.; Pure Sugar, ℥xxv. Dissolve the Muriate in a little hot water; mix it with the tincture and the ipecacuan and sugar; and, with a sufficiency of Mucilage, beat the whole into a proper mass, which is to be divided into fifteen-grain lozenges).—Each lozenge contains about one-fortieth of a grain of muriate of morphia, and one-thirteenth of a grain of ipecacuanha. Useful to allay tickling cough.

Antidotes.—In a case of poisoning by opium, the first indication is to remove the poison from the stomach, the second is to neutralize any of it which may be retained in the system, and the third is to obviate its injurious effects.

1. *Use of evacuants.*—Until other and more powerful evacuant means can be obtained, we should have recourse to tickling the throat with the fingers, or with a feather dipped in oil. As domestic emetics, mustard or salt may be exhibited. A dessert-spoonful of flour of mustard, or a table-spoonful of salt, may be taken, stirred up in a tumblerful of water. The stomach-pump is, however, the best means of evacuating the contents of the stomach, and when it can be procured, should always be preferred. The emetics usually resorted to are the sulphates of zinc and copper: the first is preferred. It should be given in doses of from one to two scruples. The dose of sulphate of copper is less,—from five grs. to fifteen. Ipecacuanha or tartar emetic may be resorted to when the other means are not at hand. Clysters, containing fifteen or twenty grs. of tartar emetic, may be administered; or, in extreme cases, a solution of one or two grs. of this salt may be injected into the veins, taking care to prevent the introduction of air.

2. *Use of chemical antidotes.*—There are no known agents which completely destroy the activity of opium by their chemical properties, and which can be resorted to in these cases. Infusion of galls, however, is regarded as the best, though an imperfect antidote. Magnesia, as well as iodine and chlorine, have also been recommended.

3. *Use of therapeutical means to obviate the effects.*—The following are the principal means which have been found efficacious:—

(*a.*) *Rousing the patient*, by exercising him up and down a room between two men. It may sometimes be necessary to continue this for several hours. (*b.*) *Cold affusion.*—Dashing cold water over the head and chest is an exceedingly valuable agent. It oftentimes assists the operation of emetics. (*c.*) *Irritants.*—The application of irritants to the body is also sometimes a useful practice: thus blisters and sinapisms to the feet. (*d.*) *Venesection.*—Blood-letting is sometimes necessary; but it can be only safely practised after the opium has been withdrawn from the stomach. Orfila says, under these circumstances it never increases, but in most cases materially relieves, the symptoms. (*e.*) *Stimulants.*—Ammonia, camphor, musk, coffee, and other stimulants, are sometimes used with advantage. (*f.*) *Vegetable acids.*—Orfila has found the vegetable acids to be the best anti-narcotics. For this purpose, drinks of vinegar and water, lemon juice, or cream of tartar and water, should be given every ten minutes. These agents, however, should not be resorted to till the poison has been evacuated from the stomach. (*g.*) *Artificial Respiration.*—As a last resource this is on no account to be omitted. Death has on several occasions been apparently averted by it. An interesting case, in which it was successfully practised, was published many years ago by Mr. Whately, (*Med. Obs. and Inq.* vi. 331). Natural respiration was extinct when it was begun. In another successful case, related by Mr. Smith (*Med. Chir. Trans.* xx. 86), artificial respiration was kept up for four hours and a half, (with an interval of an hour). When it was commenced there was no pulse at the wrist, and only a slight irregular action of the heart, indicative that life was not quite extinct. A third case, also successful, is that of an infant ten days old, who had taken twenty-five or thirty drops of laudanum intended for the mother, and had lost the power of deglutition, was comatose, and had several convulsions. Artificial respiration was sustained for two or three hours, (*United States Dispensatory*).

ORDER 79. MENISPERMA'CEÆ, *Decandolle*.—THE COCCULUS TRIBE.

Menispermeæ, *Jussieu*.

ESSENTIAL CHARACTER.—*Flowers* (by abortion ?) unisexual, usually diœcious, very small. *Floral integuments* in one or several rows, each of which consists of three or four parts, hypogynous, deciduous. *Petals* sometimes absent. *Males: stamens* monadelphous, or rarely distinct; sometimes equal in number and opposite to, the petals; at other times three or four times as many; *anthers* adnate, turned outwards, or inserted on the apex of the filament. *Females: ovaries* sometimes numerous, each with one style cohering slightly at the base; sometimes solitary, crowned with many stigmas, internally many-celled, and, therefore, consisting of many carpels soldered together. *Drupes* usually berried, one-seeded, oblique or lunate, compressed. *Seed* of the same shape as the fruit; *embryo* curved or turned in the direction of the circumference; *albumen* none, or small and fleshy; *cotyledons* flat, sometimes lying face to face, sometimes distant from each other, and lying in two cells of the seed!; *radicle* superior, but sometimes appears inferior when the apex of the fruit is, by the mode of growth, contiguous with the base.—Sarmentaceous, flexible, tough *shrubs*. *Leaves* alternate, simple or rarely compound, mucronate. *Flowers* small, usually racemose (D. C.)

PROPERTIES.—The roots of several species are bitter and tonic; the seeds of some of them are narcotic.

Coc'culus palma'tus, Decandolle, L. E.—*The Calumba Plant.*

Menispermum palmatum, *Lamarck*.
Sex. Syst. Diœcia, Hexandria.
(Radix, *L. D.*—Root *E.*)

HISTORY.—Franciscus Redi (*Exp. circa varias res nat.* p. 179) in 1675, is the first writer who mentions the root of this plant: he praises it as an alexipharmic or antidote for poisons. Cartheuser afterwards examined it; but Dr. Thomas Percival (*Med. Essays*, vol. ii. p. 3, 1773) gave the best account of it. This root has been known by various names, such as *Calumba*, *Colombo*, *Calomba*, and *Colomba*. Its native country and history were long involved in obscurity. In 1830, Dr. Hooker (*Bot. Mag.* 2970-71) published a complete description of both the male and female plants. The root was at first supposed to come from Colombo, a town of Ceylon, and from which it was said to derive its name. But it is now known to be the produce of Mozambique. Its English name Calumba is derived from the Portuguese word *Kalumbo*, the *o* in which is mute (Berry, *As. Research.* x. 385.)

BOTANY. *GEN. CHAR.*—*Flowers* unisexual, (always ?) diœcious. *Calyx* of twelve sepals in four series, with two, three, or more close-pressed bracteoles. *Males: stamens* six, or rarely three, opposite to the inner sepals, distinct; *anthers* two-celled, terminal, dehiscing vertically; *filaments* either filiform with the anther cells horizontal, approximate, and each externally two-lobed, or thickened at the apex with the cells divaricating downwards, and separated by the connective. *Females: ovaries* three, six, or numerous. *Drupes* one to six, or numerous, one-celled, one-seeded. *Peduncles* axillary or rarely lateral; males usually many-flowered; females generally few-flowered, without bracts, or with very small ones if present (Lindley).

Sp. Char.—*Leaves* cordate at the base, five- to seven-lobed; lobes quite entire, acuminate, somewhat hairy. *Stems* and *ovaries* clothed with glandular hair (D. C.)

Fig. 240.

Cocculus palmatus.
(Male plant.)

Root perennial, of several fasciculated, fusiform, fleshy tubers, with a brown, warty epidermis; internally deep-yellow, odourless, very bitter. *Stems* annual, herbaceous, twining, beset at the lower part with long glanduliferous hairs: of the males, simple; of the females, branching. *Leaves* alternate, nearly orbicular, wavy on the margin, with long hairy footstalks. *Racemes* axillary, solitary; in the male plants compound. *Flowers* small, green. *Fruit* drupaceous or berried, about the size of a hazel-nut, densely clothed with long spreading hairs, tipped with a black oblong gland (Bojer, in Hooker's *Bot. Mag.* tt. 2970-71).

Hab.—Thick forests on the shores of Oïbo and Mozambique, as well as inland for 15 or 20 miles.

Preparation of the Roots.—The natives never cultivate the plant, the spontaneous produce being sufficient. The roots are dug up in March (the hot season), the offsets from the main root are cut in slices, strung on cords, and hung up to dry in the shade. It is deemed fit for commerce, when, on exposure to the sun, it breaks short; and of a bad quality when it is soft or black.

Description.—Calumba or Colombo root (*radix calumbæ*) is met with in flat circular or oval pieces, of from half an inch to three inches diameter, and from one to three or four lines thick. It occurs also in cylindrical pieces of from one to two inches long. The epidermis covering the sides of the pieces is of a yellowish-gray or brownish colour, smooth or irregularly rugous. The transversal surfaces are of a greenish or greyish-yellow colour, depressed in the middle from the great shrinking of the medulla in the drying process, and consist of three or four concentric layers. The outer or cortical portion varies in thickness, but is usually about two or three lines thick. It is separated from the ligneous portion by a dark-coloured layer, not exceeding a hair in thickness. The internal or medullary portion is light, spongy, and shrunk. The odour of calumba is faint, but somewhat aromatic: the taste aromatic, and very bitter. In the larger and thicker pieces small holes are occasionally observed, which have been made for the convenience of drying. On account of the starch which it contains, the root is readily attacked by insects.

I am indebted to Mr. N. B. Ward for a sample of calumba root cultivated at the Mauritius. It is deficient in the bright greenish-yellow tin[t] of the Mozambique calumba.

Commerce.—In the year 1838, duty (2d. per lb.) was paid on 19,805 lbs. and in 1839 only on 9384 lbs. of calumba.

Composition.—The more recent analyses of Calumba root are those of Planche, (*Bull. de Pharm.* iii. 189), and Buchner, (*Pharm. Centr.-Blatt für* 1831, S. 429).

	Planche.	*Buchner.*
Bitter matter	13	10 to 12 2
Animal matter, soluble in water and not in alcohol	6	0
Yellow resinous extractive	0	5·0
Volatile oil	a trace	0·0
Wax	0	0·2
Gum	9	3·8 to 4 7
Starch	33	30 to 35
Vegetable medulla [pectin ?]	0	17·4
Woody fibre	39	12·6
Water	0	9·8
Loss		?
Calumba root	100	100

1. *Odorous Principle* (*Volatile Oil?*)—The odour of the root is supposed to depend on a volatile oil, traces of which were procured by Planche. The distilled water of the root possesses the odour of the latter.

2. *Calumbin*—(*Bitter Principle*).—A crystallizable, odourless, very bitter, neutral substance extracted from Calumba root by Wittstock, (*Pharm. Centr.-Blat. für* 1830, s. 517). Its crystals are rhombic prisms. It is fusible; very slightly soluble in water, alcohol, ether, and volatile oils. Boiling rectified spirit dissolves about 1-40th of its weight. It dissolves in acids and alkalies; its best solvent being acetic acid. It is unaffected by metallic solutions, and by infusion of nutgalls. Sulphuric acid dissolves it, assuming first a yellow, then a red colour. Its composition, according to Liebig, is *carbon* 65·45, *hydrogen* 6·18, *oxygen* 28·37 : or $C^{12}\ H^{7}\ O^{4}$.

Planche describes the active principle of calumba as a *yellow bitter matter* soluble in water and alcohol, and yielding no precipitate either with the salts of lead or infusion of galls.

3. *Starch.*—This constitutes about one-third by weight of the root. It renders the root an easy prey to insects.

Chemical Characteristics.—If the root be moistened with water and then touched with tincture of iodine, it becomes black. A decoction of the root when cold forms with a solution of iodine a blue colour (*iodide of starch*). Sulphate of iron, emetic tartar, and gelatine, produce no obvious change in an infusion of calumba, shewing the absence of tannic and gallic acids. Litmus detects no free acid. Infusion of nutgalls causes in the infusion of calumba a precipitate (*tannate of starch?*)

Adulteration.—The root of *Frasera Walteri*, called the *American* or *false calumba*, (see p. 901), has been occasionally substituted for calumba root on the continent. Such a fraud would not be practicable in England, at least to any extent, as the appearance of the root is quite dissimilar to that of the genuine calumba. It is distinguished chemically from the latter by three characters: 1st, It undergoes no change of colour when touched with tincture of iodine, shewing that it contains no starch; 2ndly, It becomes blackish-green on the addition of sulphate of iron; 3rdly, It yields a precipitate with a solution of gelatine. The two last characters indicate the presence of tannic acid.

Physiological Effects.—Calumba is an excellent tonic; promoting the appetite, assisting the digestive process, and improving the quality of the secretions from the gastro-intestinal mucous membrane. It is not a stimulant; for Dr. T. Percival took a scruple of it on an empty stomach, but did not observe that it had the least effect on the regularity, fulness, or velocity of the pulse. In another experiment he swallowed half a drachm: in ten minutes his pulse was fuller, and slower by three beats, and continued so for three-quarters of an hour. In consequence of the quantity of starch and gum which it contains, it is sometimes termed a *mucilaginous* or *demulcent tonic*. *Cetraria islandica* and Simaruba bark agree with calumba in this circumstance. But from them, as well as from Quassia, it is distinguished by its aromatic properties. In some respects (*i. e.* in its tonic and aromatic qualities) it approximates to rhubarb, but is devoid of the purgative and astringent properties of the latter. Its want of astringency distinguishes it from the astringent tonics (as cinchona). Full doses of it, in the form of powder, given when the stomach is very irritable, cause vomiting. It does not appear either to constipate or relax the bowels. We are not acquainted with the effects of excessive doses of it. Poisonous properties have been assigned to it by Buchner (*Toxikol.* s. 229), who states, that Härtl, one of his pupils, applied a grain of the etherial extract of calumba, deprived of wax by repeated solution in water, to a wound in the leg of a rabbit, and that it proved fatal in ten hours.

Uses.—Calumba is one of our most useful stomachics and tonics. Its great value consists in its not being apt, like other and more powerful tonics, to create nausea, sickness, febrile disorder, or headache, so that it is tolerated when other remedies of this class would be immediately rejected. Indeed on many occasions it evinces a positive power of checking vomiting. Schwilgué (*Mat. Méd.* ii. 374), in order to test its anti-emetic qualities, gave it when vomiting had commenced after the use of emetic tartar and ipecacuanha. It frequently arrested the vomiting. He also gave it in conjunction with these emetics, and observed that the vomiting occurred more slowly than usual, and was milder. Probably it owes these valuable properties to a combination of circumstances; such as its freedom from acidity and astringency, the large quantity of starch which it contains (from which it acquires demulcent properties), and the peculiar operation of its bitter principle. The following are the principal uses to which it has been applied:—

1. *In a languid state of the stomach, with general debility*, attended with want of appetite, indigestion, nausea, and flatulence, experience has fully established the value of calumba, and has proved the justice of the encomiums passed on it by Dr. T. Percival. It is of all tonics the least likely to disagree with the stomach. In the stage of convalescence after an attack of fever, the infusion of calumba is an excellent preparative for the more powerful tonics (infusion of cinchona and disulphate of quina). In those forms of dyspepsia attended with great acidity of stomach, it may be given with advantage in combination with bicarbonate of potash.

2. *To allay vomiting*, when not dependent on inflammatory conditions of the stomach, calumba is often highly serviceable; as in bilious vomiting, in the sickness which so frequently attends pregnancy, and dentition. Even vomiting arising from renal calculi or diseased kidney has been somewhat palliated by calumba. I have seen the most satisfactory results from the combined use of infusion of calumba and effervescing

draughts (composed of citric acid and bicarbonate of potash) in those occasional attacks of vomiting especially observed in delicate females, and which are commonly termed bilious attacks. By this treatment the violence and continuance of the vomitings have been diminished, and the continued employment of calumba has reduced the frequency, and in some cases prevented the occurrence, of future attacks.

3. *In diarrhœa and dysentery* where tonics are admissible, as in the later periods of these diseases, when the inflammatory symptoms have subsided, and in habitual diarrhœa, calumba often proves serviceable. In Germany it is denominated *Ruhrwurzel*, (i. e. *dysenteric root*).

Administration.—Calumba is administered in the form of *powder*, *infusion*, or *tincture*. The dose of the *powder* is from gr. x. to ʒss. The infusion is the most eligible form of exhibition.

1. *Infusum Calumbæ*, L. E. *Infusum Colombæ*, D. (Calumba, sliced [in coarse powder, *E.*], ʒv. [℥ss. *E.*; ʒij. *D.*]; Boiling [distilled, *L.*] Water [Cold Water, *E.*], Oj. [Oss. *D.*] Macerate for two hours in a lightly covered vessel, and strain, *L. D.*—"Triturate the Calumba with a little of the water, so as to moisten it thoroughly; put it into a percolator, and transmit cold water till f℥xvj. of infusion be obtained," *E.*) —The facility with which this preparation undergoes decomposition is ascribed by Planche to the substance which he terms *animal matter*. Dose of the infusion, f℥j. to f℥ij. It may be conjoined with alkalies or chalybeates, without injury or obvious change.

2. *Tinctura Calumbæ*, L. E. *Tinctura Colombæ*, D. (Calumba, sliced [in small fragments; if by percolation in moderately fine powder, *E.*], ℥iij. [℥ijss. *D.*]; Proof Spirit, Oij. Macerate for fourteen days, and filter. "Digest for seven days, pour off the clear liquour, express the residuum strongly, and filter the liquors. This tincture is much more conveniently prepared by the process of percolation, allowing the powder to be soaked with a little of the spirit for six hours before putting it into the percolator," *E.*)—An excellent adjunct to bitter infusions and effervescent medicines, when given to check vomiting. Dose, fʒj. to fʒij.

Anamir'ta Coc culus, Wight and Arnott, E.—*The Cocculus Indicus Plant.*

Coc'culus subero'sus Decandolle, *D.*

Sex. Syst. Diœcia, Monadelphia.

(Fruit, *E.*—Fructus vulgo Cocculus indicus, *D.*

History.—"According to Sprengel (*Berl. Jahrb.* xxiij. 1822, S. 70), the fruit now usually called *Cocculus indicus* was introduced by the Arabians, and was described by Avicenna and Serapion under the name of *Maheradsch*" (Schwartze, *Pharm. Tabell.* S. 388, 2te Ausg.) In my copy, however, of the Latin translation of Avicenna (Venet. 1564) the word *Maheradsch* does not occur: but *Mahezeheregi* or *Maheizhera* (lib. 2ndus, tr. 2ndus, cap. 488) is said to intoxicate fish. Nor can I find it in Serapion. Cocculus indicus is sometimes termed the *Levant nut*, or *bacca orientalis*.

Botany. *Gen. Char.*—*Flowers* diœcious. *Calyx* of six sepals in a double series, with two close-pressed bracteoles. *Corolla* none. *Male: stamens* united into a central column dilated at the apex; *anthers* numerous, covering the whole globose apex of the column. *Female: flowers* unknown. *Drupes* one to three, one-celled, one-seeded. *Seed* globose, deeply excavated at the hilum; *albumen* fleshy; *cotyledons* very thin, diverging.—Twining *plants*, with a corky bark. *Leaves* more or less cordate-ovate. *Flowers* in lateral compound racemes (*Wight and Arnott*).

Sp. Char.—The only species.

A strong climbing *shrub*. *Bark* deeply cracked, ash-coloured. *Leaves* stalked, large (from eight to twelve inches long); petiole a little shorter than the leaves.

Hab.—Malabar, and Eastern islands, &c. of India.

Description.—As met with in commerce, *Cocculus indicus* (also called *Cocculus levanticus* seu *piscatorius*) has considerable resemblance to the bay berry (*bacca lauri*, see p. 799), but is scarcely so large as the latter. It consists externally of a dried, thin, blackish-brown, rugous, acrid and bitter layer, which envelopes a thin, bivalved, white, ligneous shell (*endocarp*). In the middle of this shell arises a central placenta, which is contracted at its base, but enlarged and divided into two cells superiorly. Between this placenta and the shell is an oleaginous, yellowish, very bitter nucleus (*seed*) of a semilunar form. This nucleus never wholly fills the cavity of the shell,—at least in the Cocculus indicus of commerce; for by keeping it gradually becomes atrophied, and in old samples it is not uncommon to find the shell almost empty. This change is observed also in other oleaginous seeds. By this character alone, Cocculus indicus may be instantly distinguished from the bay berry. The *Edinburgh College* requires that,—

"The kernels should fill at least two-thirds of the fruit."

Commerce.—Cocculus indicus is imported in bags from Bombay, Madras, and Ceylon. I am not acquainted with any official returns of the quantity annually brought over. From a druggist's private books I find, in 1834, about 2500 bags entered; and this probably is much below the quantity imported. The greater part is consumed for illegal purposes,—principally for adulterating beer and ale; though this practice is prohibited by the legislature, under a penalty of 200*l.* upon the brewer, and 500*l.* upon the seller of the drug.

Composition.—Cocculus indicus was examined in 1811, by Boullay (*Ann. de Chim.* lxxx. 209), and in 1834 by Pelletier and Couerbe (*Ann. Chim. et de Phys.* liv. 181). The results obtained by the last-mentioned chemists were as follows:—

Analysis of the Nucleus.	*Analysis of the Shell.*
1. Picrotoxin.	1. Menispermin.
2. Resin.	2. Paramenispermin.
3. Gum.	3. Yellow alkaline matter.
4. A fatty acid substance.	4. Hypopicrotoxic acid.
5. An odorous matter.	5. Wax.
6. Malic acid.	6. Starch.
7. Mucus.	7. Chlorophylle.
8. Starch.	8. Resinous matter.
9. Lignin.	9. Gum.
10. Waxy matter.	10. Fatty matter.
11. Inorganic substances (nitrate and sulphate of potassa, and chloride of potassium) by incineration carbonates of potash, and of lime, manganese and iron.	11. Inorganic substances (as those of the nucleus with the addition of copper.)

1. *Picrotoxin* (*Picrotoxic Acid*).—At first it was supposed to be an alkaline substance, and was termed *picrotoxia*. It is a white, crystalline, intensely bitter substance, usually crystallizing in needles, but sometimes in silky flexible filaments or transparent plates, or granular crystals. It is soluble in 150 parts of water at 57° F., in 25 parts of boiling water, in a third of its weight of alcohol, and in less than half its weight of ether. It is insoluble in the fixed and volatile oils, but is soluble in acetic acid. It does not combine with acids, but forms combinations with alkalies. It seems, therefore, to be an acid, though a feeble one. It consists of $C^{12} H^7 O_5$. The poisonous properties of the nucleus (seed) of cocculus indicus depend on picrotoxin.

2. *Menispermia* (*Menispermina; Menispermine.*)—This is an opaque, white, crystalline substance, soluble in alcohol and ether, but insoluble in water. It fuses at 248° F., and at a higher temperature is decomposed, leaving an abundant charcoal. It dissolves in, and saturates acids; and from these solutions alkalies precipitate it. Concentrated sulphuric acid has little action on it: hot nitric acid converts it into a yellow resinous substance, and oxalic acid. It is composed, according to Gay-Lussac, of $C^{18} H^{12} N O^2$. It does not appear to have any marked action on the animal economy.

3. *Paramenispermia* (*Paramenispermina; Paramenispermine*).—This is a crystalline solid, insoluble in water, scarcely soluble in ether, but dissolving readily in alcohol. It is fusible and volatile, and may be sublimed unchanged. It does not saturate acids, and, therefore, differs in this respect from the preceding substance. Notwithstanding this, however, its composition is the same.

4. *Hypopicrotoxic Acid.*—This acid is an amorphous, brown, solid, insoluble in water (cold or boiling), insoluble in ether, soluble in alkalies, and precipitable from its solution in them by the mineral acids. It is composed of, *carbon* 64·14, *hydrogen* 6·09, *oxygen* 29·77. This composition approximates to that of picrotoxin.

The *yellow alkaline matter* of the shell has been scarcely examined.

Boullay (*Journ. de Pharm.* xiv. 61) mentions a crystalline substance which he calls *menispermic acid*; but its properties require further examination. (See Casaseca, *Ann. Chim. et Phys.* xxx. 307).

Chemical Characteristics.—Iodine colours the nucleus brown. The cold watery infusion of the whole fruit is slightly acid, and produces a dark precipitate with the sesquichloride of iron. Infusion of galls also occasions a precipitate.

Physiological Effects. (*a.*) *On vegetables.*—A solution of the aqueous extract of Cocculus indicus killed a haricot plant in twenty-four hours (Marcet, *Ann. de Chem. et de Phys.* xxix. 215).

(*b.*) *On animals generally.*—It is poisonous to all animals; at least it has been found to be poisonous to dogs, goats, cows, crocodiles, birds, and insects. Goupil (quoted by Orfila, *Toxicol. Gén.*) considered it to be a local irritant; but the correctness of this opinion is denied by Orfila (*Ibid.*) When introduced into the stomach its irritant effects were confined to the production of nausea and vomiting. It acts on the cerebro-spinal system, causing staggering, trembling, tetanic convulsions, and insensibility. Goupil states, all fish who eat it die,—roach being killed very easily, barbel with more difficulty. "The barbel," we are told, "is, of all fish, that whose flesh the most frequently occasions accidents in those animals who eat it, probably because these fish, taking a longer time to die, the poison is longer subjected to the action of the digestive juices, and a considerable quantity of it is consequently absorbed." Orfila says, Cocculus indicus acts like camphor on the nervous system, and principally on the brain.

(*c.*) *On man.*—Its effects on man have not been accurately ascertained. Hill (*Hist. of the Mat. Med.*) says, three or four grains of it have brought on nauseas and faintings. It is frequently added to malt liquors, for the purpose of increasing their intoxicating powers; but, from some accounts which I have received from an Excise officer, who has been repeatedly subjected to the influence of beer thus adulterated, its action appeared to be rather on the voluntary muscles than on the intellectual powers.

The operation of *Picrotoxine* is analogous to, though stronger than, that of Cocculus indicus. Ten or twelve grains, given by the mouth, are sufficient to kill a dog. A grain and a half, injected into the jugular vein of a dog, killed the animal in twenty minutes.

USES.—Cocculus indicus is rarely employed in medicine. It has, however, been used as an external application, in the form of powder or ointment, to destroy pediculi (hence the Germans call these fruits *Läusekorner*, or *Louse grains*.) It has also been employed in some obstinate skin diseases, as porrigo; but its use requires caution, especially where the skin is not entire, on account of the danger of absorption. Notwithstanding the severe prohibitory statutes against the employment of Cocculus indicus in brewing, I have reason to believe that it is extensively used; but being employed in the form of a solution of the extract, the fraud is not easy of detection. Morrice (*Treat. on Brewing*) gives full directions for its employment. In the manufacture of porter, this author directs three lbs. of Cocculus indicus to be added to every ten quarters of malt. "It gives," says he, "an inebriating quality, which passes for strength of liquor;" and he adds "that it prevents second fermentation in bottled beer, and consequently the bursting of the bottles in warm climates.

UNGUENTUM COCCULI, E. ("Take any convenient quantity of Cocculus indicus, separate and preserve the kernels; beat them well in a mortar, first alone, and then with a little axunge, and then add axunge till it amounts, altogether, to five times the weight of the kernels.")—Used to destroy pediculi.

Jäger (*Rust's Mag.* Bd. xiv. St. i. S. 105) has an *ointment of picrotoxin*) composed of gr. x. of picrotoxin and ℥j. of lard) in obstinate forms of porrigo.

ANTIDOTE.—In poisoning by Cocculus indicus, or picrotoxin, remove the poison from the stomach as speedily as possible. No chemical antidote is known, though acetic acid has appeared to give relief. The symptoms must be combated on general principles, no peculiarities in the treatment being known. As a last resource, try artificial respiration.

Cissam'pelos Parei'ra, Linn. E. D.—*Pareira brava* or *Velvet Leaf*.

Sex. Syst. Diœcia, Monadelphia.

(Radix, *L.*—Root, *E.*)

HISTORY.—The root of this plant was first mentioned by Piso (*Hist. Nat. Brasil*, 94) in 1648, under the name of *Caapéba*. It was introduced into Paris, in 1688, by M. Amelot, the French ambassador at Portugal (Murray, *App. Med.* i. 499).

It is usually termed *Pareira* (Parreyra) *brava*, which means, literally, *wild vine*, on account of its supposed resemblance to the root of the wild vine. The Germans call it *Grieswurzel* (*i. e.* gravel root), on account of its beneficial effects in stone or gravel.

BOTANY. *GEN. CHAR.*—*Diœcious*. *Male: sepals* four, in a double series. *Petals* four, united into a cup-shaped corolla, with usually an entire margin. *Stamens* united into slender columns dilated at the apex, bearing two two-celled anthers opening horizontally; cells placed end to end, and forming a four-lobed, four-celled annulus round the top of the column. *Female: calyx* of one! lateral sepal. *Corolla* of one! petal in front of the sepal. *Ovary* solitary. *Stigmas* three. *Drupe* obliquely reniform; but compressed, wrinkled round its margin. *Seed* solitary, uncinate; *embryo* long, terete, inclosed in a fleshy albumen (Wight and Arnott).

Sp. Char.—*Leaves* peltate, subcordate, ovate-articulate; silky-pubescent beneath. Female *racemes* larger than the leaf. *Berry* hispid (*D. C.*)

A climbing *shrub*. *Root* woody, branching. *Stem* round, smooth, or with close-pressed down. *Leaves* aristate at the point, when full-grown smooth above, underneath covered with silky pubescence (hence called *velvet leaf*), but not truly downy. *Flowers* small, yellow. *Berry* scarlet, round or reniform, hispid.

Hab.—West India Islands and Spanish Main.

Description.—The root of Cissampelos Pareira, commonly termed *pareira brava (radix pareiræ bravæ)*, is sometimes imported under the name of *abuta* or *butua root (radix butuæ)*. Von Martius says, that in the Brazils, Cissampelos Pareira is called *Butua* or *Capeeba*. Pareira brava occurs in more or less cylindrical pieces, sometimes flattened or bluntly angular. Some of the pieces are as thick as a child's arm,—their length often a foot or more long. Externally they are covered with a dark-brown rind or cortex, which is furrowed longitudinally, and wrinkled transversely. The wrinkles have very much the appearance of large, transversely elongated lenticellæ. The surface of the transverse section of the root is of a yellowish-gray colour, and presents a number of concentric circles (the annular layers), traversed by numerous radiating lines (medullary rays); between these lines are triangular bundles of woody fibres and ducts,—the latter are large, and being cut transversely, constitute the numerous holes or apertures presented by the cut surface. The circles or layers occasionally assume a very excentric appearance.

The number of concentric circles varies with the age of the root. The fracture of the root is coarsely fibrous. The taste is sweetish—aromatic, afterwards bitter and unpleasant. The root has no odour.

Substitution.—The pareira brava of commerce yields most unequal quantities of extract. This circumstance, as well as some variation in the appearance of the pieces, leads to the belief that the roots (and stems?) of more than one plant is sold under this name. A sample of a supposed spurious root (see *Lond. Med. Gaz.* vol. xviii. p. 992; and vol. xix. p. 835) yields "only a very minute quantity of the extract; and the decoction prepared from it, according to the usual formula, has only a slightly bitter taste, instead of the strong bitter of the decoctions" of the true root. A piece of this supposed spurious root presents an appearance of medulla, and is covered externally with a lichen, whence it would appear to be a portion of a stem.

Composition.—Pareira brava has been analyzed by Feneulle (*Journ. de Pharm.* vii. 404), who found the constituents to be, *a soft resin, a yellow bitter principle, a brown colouring principle, vegeto-animal matter, fecula, supermalate of lime, nitrate of potash,* and some *ammoniacal and mineral salts.* More recently, Wiggers (*Berl. Jahrb.* xl. 223. 1838) has announced the discovery of a new vegetable alkali, which he calls *cissampelin*, in this root.

Feneulle considers the *yellow bitter matter* to be the active principle of the root. It is described as being soluble in both alcohol and water. From its solution it was precipitated by tincture of nutgalls as well as by subacetate of lead. In these properties it appears to agree with cathartine (see p. 1167); but it is, probably, a mixture of several substances.

The properties of *cissampelin* have not been described. Wiggers says it is a strong saline base, soluble in ether and in acetic acid. From its acetic solution it is precipitated by carbonate of soda.

Chemical Characteristics.—The presence of starch in the root is shown by iodine. An infusion of the root yields a precipitate on the addition of infusion of galls, and is rendered brown by the sesquichloride of iron.

Physiological Effects.—I am unacquainted with any experiments made to determine the effects of this root in the healthy state of the body. From its taste, botanical affinities, and effects in diseases, it appears to possess a tonic power, and occasionally to act as a diuretic. Furthermore, its efficacy in certain maladies of the urinary organs induces us to ascribe an almost specific influence to this root over the mucous membrane lining the urinary passages. It certainly does appear to have the power of altering the quality of the urinary secretion. Large doses prove aperient.

Uses.—It was originally introduced into medicine as a lithontriptic. Its powers in this way were at one time highly vaunted, and Helvetius even went so far as to assert that calculi, the size of an olive, had disappeared under its use, and that the operation for lithotomy was no longer necessary! We now employ it almost solely *in discharges from the urino-genital mucous membrane.*—It has been used in gonorrhœa, leucorrhœa, and chronic inflammation of the bladder. In the latter of these diseases Sir B. Brodie (*Lond. Med. Gaz.* i. 300) states, that he has seen more good done by this root than by the Uva-ursi. "I am satisfied," says this eminent surgeon, "that it has a great influence over the disease which is now under consideration, lessening very materially the secretion of the ropy mucus, which is itself a very great evil, and, I believe, diminishing the inflammation and irritability of the bladder also." He recommends it to be taken in the form of a concentrated decoction, to which may be added some tincture of hyoscyamus; and in these cases, in which there is a deposit of the triple phosphates, muriatic or diluted nitric acid may be added.

Administration.—The *powder* has been given in doses of from half a drachm to a drachm. But the *infusion* or *decoction*, to which some *extract* has been added, is to be preferred. A *tincture* or *essence* has been prepared by digesting one part of the root in five parts of rectified spirit. It is reputed diuretic and anticatarrhal. Its dose is f℥j.

1. *Infusum Pareiræ*, L. E. (Pareira, ℥vi.; Boiling Water, Oj. Macerate for two hours in a lightly covered vessel, and strain [through calico, *E.*] Dose, f℥j. to f℥iij. It will be advisable to increase the strength of this decoction by the addition of some extract of pareira to it. Furthermore, narcotics (as opium or hyoscyamus) or acids may be conjoined according to circumstances. Sir B. Brodie employs a *decoction of pareira* (prepared by boiling half an ounce of the root in three pints

of water down, by gentle simmering, to one pint); of this eight or twelve ounces should be taken daily.

2. *Extractum Pareiræ*, L. E. (Prepared as Extract of Gentian [as Extract of Liquorice-root, *E.*]) Dose, gr. x. to ʒss. It is usually given in conjunction with the infusion or decoction.

Other Medicinal Menispermaceæ.

The student must not confound *pareira brava* with the *pereira bark* belonging to Strychnaceæ, and before noticed (see p. 922), nor with the *Pereiria medica*, Lindley (*Fl. Med.* 370), a menispermaceous plant, whose root is employed by the Cingalese as a stomachic.

Order 80. Magnolia'ceæ, *Decandolle*.—The Magnolia Tribe.

Magnoliaceæ and Winteraceæ, *Lindley*.

Essential Character.—All the parts of the flower disposed in ternary number. *Sepals* three to six, deciduous. *Petals* three to twenty-seven, in many series, hypogynous. *Stamens* numerous, free, inserted on the torus beneath the ovaries; *anthers* adnate, elongated. *Ovaries* numerous, inserted on the torus above the stamens, generally disposed like a spike, monostylous; *styles* short; *stigmas* simple. *Carpels* as many as the ovaries, one-celled, one- or many seeded; capsular, and dehiscing by a superior chink; or capsular and bivalved, dehiscing by an inferior chink; or follicular; or somewhat fleshy and indehiscent; or, lastly, samariform, aggregate, or partially united into a loose or dense strobile. *Seeds* attached to the internal angle of the carpels; *albumen* fleshy; *embryo* straight, small, inferior.—Elegant *trees* or *shrubs*. *Leaves* alternate, pinnatinerved. *Flowers* conspicuous, often powerfully odoriferous (D. C.)

Properties.—Bark tonic and aromatic. The same properties are possessed by some of the fruits. The flowers by their odour readily occasion nausea, headache, and faintness.

Drimys Win'teri, Decandolle, D.—*Winter's Bark Tree.*

Wintera aromatica, *Murray*.

Sex. Syst. Polyandria, Tetragynia.

(Cortex, *D.*)

History.—William Winter, captain of one of the ships which accompanied Sir Francis Drake, in the year 1578, to the Straits of Magellan, returning in 1579, brought the bark of some trees, which he had cut down there, to Europe. From this circumstance Clusius (*Exot.* lib. iv, cap. 1, p. 75) called it *Winter's bark* (*Winteranus cortex*). It was afterwards confounded with Canella bark (see p. 1233).

Botany. *Gen. Char.*—Carpels congested, baccate, many-seeded. *Filaments* thickest at the apex; cells of the anther separate (D. C.)

Sp. Char.—*Leaves* oblong, obtuse, glaucous beneath. *Peduncles* simple, approximated, or very short, divided into elongated pedicels (D. C.)

Fig. 241.

Drimys Winteri.

A large forest *tree*. *Branches* often tuberculated from the scars of the old footstalks. *Sepals* two to three, green. *Petals* seven, milk-white. *Fruit* ovate (See Solander's *Med. Observ. and Inq.* vol. v. p. 41).

Hab.—Straits of Magellan, Chili, Peru, New Grenada.

Description.—Winter's bark (*Cortex Winteri* seu *Winteranus*) occurs in quills or rolled pieces, commonly a foot long, one or two inches in diameter, and two or three lines thick. Its colour externally is pale yellowish, or dull reddish-gray, with red elliptical spots; internally it is reddish-brown. Its odour i aromatic, its taste warm and pungent. The characters by which it is distinguished from Canella bark have been already pointed out (see p. 1233). Its infusion is darkened by the salts of iron.

COMPOSITION.—Winter's bark has been analyzed by M. Henry (*Journ. de Pharm.* t. v. p. 489), who found its constituents to be *resin*, *volatile oil*, *colouring matter*, *tannin*, *acetate of potash*, *chloride of potassium*, *sulphate of potash*, *oxalate of lime*, and *oxide of iron.*

1. *Volatile oil* (*Oleum corticis Winteri*).—Pale-yellow, lighter than water, with a very hot and acrid taste. By standing it is separated into two parts: one (the most abundant part) a greenish-yellow liquid; the other heavier (but lighter than water), white, and of a fatty consistence.

2. *Resin*—Reddish-brown, and almost odourless. Its taste is at first feeble; then acrid and persistent.

PHYSIOLOGICAL EFFECTS AND USES.—Stimulant, aromatic, and tonic. Its uses are similar to those of cinnamon and canella alba. Winter employed it in scurvy. It is seldom employed. Dose, ʒss. or ʒj.

Other Medicinal Magnoliaceæ.

Illicium anisatum is an evergreen tree, growing in Japan and Cochin-China. Its fruit constitutes the *star-anise* (*anisum stellatum*) of the shops. It consists of a variable number (usually six to twelve) of hard woody follicles, disposed in a star-like form, each containing an oval reddish seed. It has the odour of common anise (*Pimpinella Anisum*), but somewhat sweeter. By distillation it yields the *oil of star-anise* (*oleum badiani*) which closely resembles, and is often substituted for, the oil of common anise (see p. 1036); but it congeals less readily than the latter. Star-anise is aromatic and carminative. Both the fruit and the oil are employed by liqueur-makers. As regards its effects it might be substituted for common anise.

ORDER 81. RANUNCULA'CEÆ, *Decandolle.*—THE CROW-FOOT TRIBE.

ESSENTIAL CHARACTER.—*Sepals*, three to six, hypogynous, deciduous, generally imbricate in æstivation, occasionally valvate or duplicate. *Petals* three to fifteen, hypogynous, in one or more rows, distinct, sometimes deformed. *Stamens* definite or indefinite in number, hypogynous; anthers adnate. *Carpels* numerous, seated on a torus, one-celled or united into a single many-celled pistil; *ovary* one or more seeded, the *ovules* adhering to the inner edge; *style* one to each ovary, short, simple. *Fruit* either consisting of dry akenia, or baccate with one or more seeds, or follicular with one or more valves. *Seeds* albuminous; when solitary, either erect or pendulous; *embryo* minute; *albumen* corneous.—*Herbs*, or very rarely *shrubs*. *Leaves* alternate or opposite, generally much divided, with the petiole dilated and forming a sheath half clasping the stem. *Stipules* occasionally present. *Hairs*, if any, simple. *Inflorescence* variable (*Lindley*).

PROPERTIES.—Mostly poisonous. Acridity is the prevailing quality, conjoined, in a considerable number of instances, with a narcotic quality. Several of the species are topical benumbers.

Ranun'culus a'cris, Linn. D.—*Upright Meadow Crowfoot.*

Sex. Syst. Polyandria, Polygynia.

(Folia, *D.*)

BOTANY. *GEN. CHAR.*—*Calyx* of five sepals; sepals not separate at the base, deciduous. *Petals* five, rarely ten, with nectariferous scales at the base. *Stamens* and *ovaries* numerous. *Caryopsides* ovate, somewhat compressed, terminating in a short mucro or horn, scarcely larger than the seed, smooth, striated or tuberculated, arranged in a globose or cylindrical head (D. C.)

Sp. Char.—*Calyx* spreading. *Flower-stalks* round and even. *Leaves* in three deep-lobed and cut segments; those of the uppermost linear and entire. *Stem* erect, covered with close hairs (Smith, *Eng. Fl.*)

Perennial. *Flowers* yellow. *Petals* with a scale at the base.

Hab.—Indigenous; very common in meadows and pastures. Flowers in June and July.

Composition.—Not analyzed. Its *acrid principle* is either very volatile or readily undergoes decomposition, as, by drying, the plant loses its acridity.

Physiological Effects.—A powerful acrid. Inflammation of the palm of the hand has been produced by pulling it up and carrying it a little distance (Curtis, *Fl. Lond.* vol. i.) Withering (*Arrang. of Brit. Plants*, iii. 681) says it easily blisters the skin. Orfila (*Tox. Gén.*) has shewn, by experiments on animals, its power of causing inflammation of the tissues to which it is applied.

Uses.—It has been applied as a rubefacient and epispastic, but is far inferior to cantharides and mustard, on account of the uncertainty of its operation.

Ranun'culus Flam'mula, Linn. D.—*Lesser Spear-wort Crowfoot.*

Sex. Syst. Polyandria, Polygynia.

(Herba recens, *D.*)

Botany. *Gen. Char.*—See R. Acris.

Sp. Char.—*Leaves* ovate-lanceolate, bluntish stalked. *Stem* reclining. *Root* fibrous. *Seeds* smooth (Smith).

Perennial. *Leaves* nearly entire, subserrate. *Flowers* bright gold colour.

Hab.—Indigenous; sides of lakes and ditches abundant.

Physiological Effects and Uses.—Similar to those of *Ranunculus acris.*

Helleb'orus ni'ger, Linn. E. D.—*Black Hellebore*, or *Christmas Rose.*

Sex. Syst. Polyandria, Polygynia.

(Root, *E.*—Radix, *D.*)

History.—According to Sprengel (*Hist. Rei Herb.* i. 226) this is the plant called by the Abbess Hildegard, *Christiana.*

It must not be confounded with the ἐλλέβορος μέλας (*black hellebore*) of Dioscorides (lib. iv. cap. 151), which, according to Dr. Sibthorp (*Fl. Græcæ*), was the plant which he has described and figured under the name of *Helleborus officinalis.* Hippocrates employed hellebore in medicine. Melampus employed it with great success in the treatment of madness 1400 years before Christ. His use of it is the earliest instance on record of the use of a purgative, (Le Clerc, *Hist. de la Méd.* p. 27, 1729). It has been called after him *melampodium*, a term which has also been applied to Helleborus niger.

I cannot understand what circumstance can have induced the *London College* to adopt the *Helleborus officinalis*, Sibth. as the source of the hellebore root of the shops. That it is an error cannot be for a moment doubted.

Botany. *Gen. Char.*—*Calyx* persistent, of five sepals; sepals roundish obtuse, large, usually green. *Petals* 8 to 10, very short, tubular, narrow and nectariferous beneath. *Stamens* 30 to 64. *Ovaries* 3 to 10. *Stigmas* terminal, orbicular. *Capsules* coriaceous. *Seeds* in a double row, elliptical, umbilicated, (D. C.)

Sp. Char.—*Leaves* radical, pedatisect, quite smooth. *Scape* leafless, one- to two-flowered, bracteate (D. C.)

Rhizome several inches long, tuberculated, horizontal, scaly, blackish brown externally, white internally, with many dependent, long, simple root-fibres. *Leaves* on cylindrical stalks from 4 to 8 inches long; lobes ovate-lanceolate, serrate near the point. *Scape* shorter than the petiole. *Sepals* ovate or roundish, large, white, slightly tinged with pink, eventually becoming green. *Petals* green, tubular, shorter than the stamens. *Follicles* many seeded. *Seeds* black, shining.

Hab.—Subalpine, woodland regions in the midland and southern parts of Europe.

Commerce.—Hellebore root is imported in barrels and bags from Hamburgh usually, sometimes from Marseilles.

Description.—The root met with in commerce under the name of black hellebore root (*radix hellebori nigri;* seu *radix melampodii*) consists of two parts,—the rhizome or rootstock, and the fibres which arise from it. The rhizome is half an inch or less thick, several inches long, horizontal or contorted, knotty, with transverse ridges and slight longitudinal striæ. The fibres are numerous, cylindrical, dark brown externally, internally whitish or yellowish white, with central paler cord. The odour is very feeble and scarcely perceptible, but has been compared to that of senega root. Its taste is slight at first, then bitterish, acrid, and nauseous.

Substitution.—It is probable that the roots of *Helleborus viridis* and *fœtidus* are sometimes substituted for, or intermixed with, black hellebore root. This practice certainly occurs on the continent. The root of *Actæa spicata* (sometimes called *radix hellebori nigri falsi*) is also said to be occasionally substituted for the genuine root: its stronger fibres, when cut transversely, present the form of a cross. As far as I have observed, the roots, sold in this country as black hellebore, have a very uniform appearance, and from this I have not had reason to suspect any intermixture of other roots.

Composition.—Vauquelin (*Ann. de Muséum*, viii. 87) analysed the root of *Helleborus hiemalis.* This analysis is quoted by Soubeiran (*Nouv. Traité de Pharm.* i.) as the analysis of black hellebore root. Feneulle and Capron (*Journ. de Pharm.* viii 503) analyzed the black hellebore root.

Vauquelin's analysis.	*Feneulle and Capron's analysis.*
Very acrid oil.	Volatile oil.
Extractive.	Fatty oil.
Starch.	Volatile acid.
Vegeto-animal matter.	Resinous matter.
Sugar.	Wax.
Lignin.	Bitter principle.
	Ulmin
	Gallate of potash.
	Ammoniacal salts.
Root of Helleboris hiemalis.	Root of Helleborus niger.

Acrid Oil, Vauquelin; (*Soft Resin*, Gmelin; *Helleborin*).—This substance is odourless, has an acrid taste, and is soluble in spirit. Vauquelin ascribed the activity of hellebore to it. Feneulle and Capron, on the other hand, ascribe it to a combination of the *fatty oil* and the *volatile acid*. Probably the two latter correspond to the acrid oil of Vauquelin.

Physiological Effects. (*a*.) *On animals.*—Given by the mouth to the carnivora (as dogs), it causes vomiting, frequently purging and griping. In excessive doses it produces gastro-enteritis. If the œsophagus be tied, to prevent the ejection of the root from the stomach, it causes staggering, weakness or paralysis of the hind extremities, insensibility, and death. Similar effects result from its application to a wound (Orfila, *Toxicol. Gén.*; Schabel, quoted by Wibmer, *Wirk. d. Arzneim. u. Gifte*, Bd. iii. 11). Orfila states, when the animals survive a few hours, inflammation of the rectum is a constant occurrence; whereas Vicat (*Hist. des Plant. Vén. de la Suisse*, p. 69) says it causes inflammation of all the intestines, except only the rectum: the latter statement is entirely erroneous.

(*b*.) *On man.*—Black hellebore is a local irritant, drastic, purgative, emmenagogue. Given in *small doses* it increases the secretion and peristaltic motion of the intestines, and acts as a stimulant to the pelvic circulation, thereby promoting the menstrual and hemorrhoidal discharges, and by its influence over the portal circulation contributing probably to increase the hepatic secretion. *Large doses* act as a drastic purgative, and frequently also occasion sickness. They produce a more manifest influence over the pelvic vessels, often cause cold sweats, and lower the strength of the pulse. *Excessive* or *poisonous doses* act as a narcotico-acrid poison, and cause vomiting, purging, burning pain in the stomach and intestines, cramps of the lower extremities, cold sweats, faintness, paralysis, insensibility, and death. The fresh root *applied to the skin* produces rubefaction and vesication.

As a drastic purgative it is allied to colocynth (p. 1077), from which its narcotic operation and its greater influence over the pelvic organs distinguish it.

Uses.—Black hellebore, though greatly esteemed by the ancients, is but little employed by the moderns. It is adapted for torpid, phlegmatic individuals, especially where the pelvic circulation is languid. On the other hand, in easily-excitable persons, and where any irritation of the pelvic organs (especially the uterus and rectum) exists, it proves injurious.

1. *In affections of the nervous system*, especially mania, melancholia, and epilepsy, it has long been celebrated, and under the above-mentioned conditions, at times proves serviceable.

2. *As an emmenagogue* it was greatly esteemed by Dr. Mead (*Works*, p. 563, 1762), and is still much valued by some practitioners. He gave two teaspoonfuls of the tincture in a glass of warm water twice a day. The remarks already made will readily suggest the class of cases to which it is applicable.

3. *In dropsy* its drastic operation renders it useful. Furthermore when this disease depends on, or is connected with, a languid state of the portal circulation, black hellebore proves further useful by the stimulus which it communicates to the hepatic vessels.

4. Lastly, black hellebore has been used in *chronic skin diseases*, and as an *anthelmintic*.

Administration.—The dose of powdered hellebore is from grs. x. to ℈j. as a drastic purgative. When we require a milder effect, we may give it in doses of grs. iij. to grs. viij. It has also been given in decoction; but the tincture is the most frequently employed preparation.

Tinctura Hellebori, L. (Hellebore bruised, ℥v.; Proof Spirit, Oij. Macerate for fourteen days, and strain). Dose f℥ss. to f℥j. Principally employed as an emmenagogue.

Delphin'ium Staphysa'gria, Linn. L. E. D.—*Stavesacre.*

Sex. Syst. Polyandria, Trigynia.

(Semina, *L. D.*—Seeds, *E.*)

History.—Hippocrates employed stavesacre in medicine. Sibthorpe (*Prod. Fl. Græcæ*, i. 372) found the plant growing in Crete and Zante, and identified it with the *σταφὶς 'αγρία* of Dioscorides (lib. iv. cap. 156).

Botany. *Gen. Char.* — *Calyx* deciduous, petaloid, irregular; the *sepals* elongated at the base into a spur. *Petals* four, the two upper appendiculated within the spur (D. C.)

Sp. Char.—*Spur* very short. *Bractlets* inserted at the base of the pedicel. *Petioles* pilose. *Pedicels* twice as long as the flower (D. C.)

A stout *herb*, one or two feet high. *Stem* and *petioles* hispid, with soft hairs. *Leaves* broad, palmated, stalked, five- to nine-cleft. *Racemes* lax. *Flowers* bluish or purplish. *Capsules* three, large.

Hab.—South of Europe, Levant, and the Canaries.

Description.—Stavesacre seeds (*semina staphisagriæ* seu *staphidis agriæ*) are irregularly triangular (sometimes quadrangular), slightly arched, blackish-brown, and wrinkled. They contain a white and oily nucleus. Their odour is slight but disagreeable; their taste bitter, very acrid, hot, and nauseous. Iodine colours the seeds brown. Their watery infusion is darkened by sesquichloride of iron. Infusion of nutgalls renders it turbid.

Composition.—Stavesacre seeds were analyzed in 1820 by Brandes (Gmelin, *Handb. d. Chem.* ii. 1240), and in 1821 by Lassaigne and Feneulle (*Ann. de Chim. et de Phys.* xii. 358).

Brandes's Analysis.		*Lassaigne* and *Feneulle's Analysis.*
Delphinia	8·10	Malate of delphinia.
Fatty oil	19·10	Volatile oil.
Waxy substance	1·40	Fatty oil.
Gum	3·15	Brown bitter matter.
Starch	2·40	Yellow ditto.
Woody fibre	17·20	Uncrystallizable sugar.
Phytocol *with salts*	30·67	Gum.
Vegetable albumen	3·70	Woody fibre.
Sulphates and phosphates of lime, potash, and magnesia	5·77	Animal matter. Albumen.
Water	10·00	Mineral salts.
Stavesacre seeds	100·49	Stavesacre seeds.

Hofschläger (*Journ. de Pharm.* xiii. 365) discovered in these seeds *a volatile acid.*

1. *Delphinia* (*Delphina; Delphine; Delphinum*).—As usually met with, this is a white, odourless powder. Its taste is extremely acrid and very bitter. It fuses at 248° F. It is scarcely soluble in water whether hot or cold, but dissolves in ether, and still better in alcohol. Its alcoholic solution reacts as an alkali on test paper. It is

not crystallizable, though its texture is said to be crystalline, when the powder is moistened. It saturates acids, forms salts which are acrid, very bitter, and difficultly crystallizable. From its solution in acids it is precipitated by alkalies. Its composition is $C^{27} H^{19} N O^{2}$. Its atomic weight, therefore, is 211. Couerbe (*Ann. Chim. et de Phys.* l. ii.) says that, as usually procured, it is not absolutely pure, but contains a resinous matter, and an acrid resin which he calls *staphysain*.

2. *Volatile Acid* (*Delphinic Acid?*)—Discovered by Hofschläger, is white, crystalline, volatile at a low temperature, and in small doses is a powerful emetic.

Physiological Effects.—The activity of stavesacre seeds depends partly on the delphina and partly on the volatile acid. The powder of the seeds readily excites nausea, vomiting, and purging. Orfila (*Toxicol. Gén.*) has shown that, on dogs, it acts first as an acrid, and afterwards as a narcotic poison. Its operation appears to be similar to cebadilla (see p. 635).

Uses.—Stavesacre seeds have been used to destroy pediculi, whence one of their names among the Germans of *Läusesaamen*, or *louse-seeds*. For this purpose they are employed in the form of ointment or acetous infusion. They have also been administered internally (in doses of from three to eight grains) against worms, and externally in the form of decoction (prepared by boiling of the seeds in Oij. of water) in inveterate itch.

Delphinia.—Four grains of delphinia dissolved in a drachm of rectified spirit produce, when rubbed on the skin, a sensation of burning and prickling, with tingling, and slight redness. Taken internally, in doses of half a grain, it sometimes acts slightly on the bowels, and increases the flow of urine. In larger doses, as a few grains, it gives rise to sensations of heat and tingling in various parts of the body (Turnbull, *Treat. on Painful and Nerv. Diseases*, p. 78, 1837). The diseases in which it is chiefly successful are neuralgic cases. It has also been used in rheumatic affections with some benefit. It is employed externally in the form of ointment or alcoholic solution. The *unguentum delphiniæ* consists of ʒss. of delphinia, ʒj. of olive oil, and ℥j. of lard. The *solutio delphiniæ*, composed of ℈j. of delphinia dissolved in f℥ij. of rectified spirit, is an excellent embrocation. Internally, delphinia is given in the form of pills. The *pilulæ delphiniæ* consist of gr. j. of delphinia; gr. xij. extract of hyoscyamus; and the same quantity of extract of liquorice: divide the mass into twelve pills, one of which may be taken every three hours. (Turnbull.)

Antidote.—See Veratrum Album, p. 633.

Aconi'tum Napel'lus, Linn. E.—*Common Wolfsbane* or *Monkshood*.

Sex. Syst. Polyandria, Trigynia.

(Leaves, *E.*)

History.—The ancient history of Aconite is involved in great obscurity. The Greeks make frequent reference to a most virulent poison which they term ἀκόνιτον. Theophrastus (*Hist. Plant.* ix. 16) is the earliest writer who speaks of it. As *Aconitum Napellus* is a virulent poison, and is a native of Greece, where it is known at the present day as ἀκόνιτον (*Prod. Fl. Græcæ*, i. 372), it would at first appear probable that our common aconite was the plant referred to by the ancient Greeks. But the characters of it as given by Theophrastus quite preclude this supposition; and I believe no one has been able to identify satisfactorily the plant described by this ancient naturalist. (Consult J. E. F. Schultze, *Toxicol. Vet.* p. xiii. 1788). Dioscorides (lib. iv. cap. 77 and 78) has noticed two kinds of ἀκόνῑτον.

BOTANY. *GEN. CHAR.* — *Calyx* petaloid, irregular, deciduous or withering; upper sepal concave, helmet-shaped. *Petals* two, superior (nectaries), on long stalks, expanded at the apex into a bag hidden beneath the helmet (D. C.)

SP. CHAR.—*Flowers* densely spiked or loosely panicled. *Helmet* semicircular, rarely boat-shaped. Bag of the *petals* somewhat conical. *Spur* short, thick, inclined. Wings of the *stamens* cuspidate or evanescent. Lobes of the *leaves* cuneate pinnatisect. *Ovaries* three, rarely five, smooth or pilose (D. C.)

Perennial *herb*. *Root* tapering. *Stem* simple. *Flowers* blue.—This species is subject to great variation in the dense or loose condition of the inflorescence, in the form of the helmet, the colour and size of the flower, the breadth and the number of slashes of the leaves, the downiness of the parts of the plant, and the condition of the stem. Decandolle (*Prodr.* i. 62) admits no less than twenty-nine varieties.

HAB.—Europe. It is placed among indigenous plants, but it is a doubtful native.

The *Dublin College* has adopted *Aconitum paniculatum* Decandolle, as the officinal species, and direct the leaves (*folia*) to be used.

The *London College* has followed the Dublin College, except that they direct the root (*radix*) as well as the leaves (*folia*) to be employed.

I confess myself unacquainted with any just grounds for this preference. The *Aconitum Napellus* is one of the most active species of the genus, and no good evidence has yet been adduced to prove its inferiority to the *A. paniculatum*, var. γ. *Storkianum*, which Stork published as *A. Napellus officinalis*. Moreover, the roots of *A. paniculatum* are not found in commerce, nor is the plant grown (except in botanical gardens) in this country; so that druggists and apothecaries cannot, if they would, obey the directions of the London and Dublin Colleges.

DESCRIPTION.—Aconite root (*radix aconiti*), when fresh, consists of a tapering rootstock, placed perpendicularly, or nearly so, in the earth, and of numerous, cylindrical, fleshy fibres arising from it. At its upper and thickest part, the rootstock seldom exceeds the thickness of the finger; inferiorly it is attenuated and filiform. Sometimes two or three rootstocks are conjoined. In the latter case the root has a palmated appearance. Its total length is three or four or more inches. Its colour, as well as that of the fibres, is externally coffee brown; its odour is earthy. Internally it is white and fleshy. Its taste is bitter; but after a few minutes a remarkable numbness and tingling is perceived on the lips, tongue, and fauces. By drying, the root shrivels, and becomes darker coloured. The root should be gathered in the spring, just before the leaves appear. The *leaves* (*folia aconiti*), when chewed, have the same taste, and produce the same feeling of numbness.

COMPOSITION.—No complete analysis either of the root or the leaves of *Aconitum Napellus* has been made. The following are the constituents of the root of *A. Lycoctonum*, according to Pallas (*Journ. de Chim.-Méd.* i. 192) :—*A black oil, a green fatty matter, a substance having some analogy with the vegetable alkalies* [impure aconitina ?], *vegetable albumen, starch, lignin,* and some *salts.*

The leaves of *Aconitum medium Schraderi* were analyzed by Bucholz (Gmelin, *Handb. d. Chem.* ii. 1241).

Both Brandes and Peschier announced the existence of a peculiar alkali (*aconitina*) in aconite. Their statement was confirmed, in 1825, by Pallas (*op. supra cit.*), and, in 1832, by Geiger and Hesse (*Journ. de Chim.-Méd.* x. 464). Peschier also asserted that aconite contained a peculiar acid (*aconitic acid*). His assertion has been substantiated by L. A. Buchner, jun. (*Pharm. Central-Blatt. für* 1838, S. 439). Most chemists have admitted the existence of *a volatile acrid principle* in aconite; but it has not hitherto been isolated.

1. *Aconitina* (*Aconite*).—As prepared by Mr. Morson, this substance presents the following properties:—It is a white, odourless solid, either dull and amorphous or somewhat sparkling, and apparently crystalline. As it is usually described as being uncrystallizable, I have carefully examined a supposed crystalline mass with the microscope, but I could not detect distinct crystals. The fragments appeared like thin plates of chlorate of potash, and, though they varied greatly in shape, the triangular form seemed predominant. Heated in a tube, aconita readily fuses, and forms a pale amber-coloured liquid; and at a higher temperature decomposes. It is not volatile. Heated on platinum, or over a spirit-lamp, it is speedily and entirely dissipated. It is soluble in alcohol, ether, and the acids. From its acid solution it is precipitated by ammonia. A minute portion of it mixed with lard, and applied to the eye, causes *contraction* of the pupil, as I have repeatedly seen. Geiger and Hesse state that the aconitina which they obtained produces *dilatation* of the pupil. Mr. Morson's aconitina is so powerful that one-fiftieth of a grain has endangered the life of an individual. It is the most virulent poison known, not excepting hydrocyanic acid.

2. *Volatile Acrid Principle.*—This, though admitted by several chemists, has not been isolated. Geiger (*Pharm. Central-Blatt. für* 1831, 491) submitted the fresh herb of Aconitum Napellus, with water, to distillation, and obtained a liquor having an acrid taste, an unpleasant odour, and whose emanations affected the eyes. May not this volatile principle be the product of the decomposition of the aconitina? The following circumstances favour this suggestion:—1st. The fresh herb and root have little odour; 2dly, the local effect of aconitina is similar to that of the root and leaves; 3dly, aconitina, when mixed with the other constituents of the plant, readily undergoes decomposition, so that considerable nicety of manipulation is required in the extraction of it; and Mr. Morson tells me he has sometimes failed to obtain it.

3. *Aconitic Acid.*—In the evaporation of the juice of aconite, octahedral crystals of *aconitate of lime* are frequently deposited. From these L. A. Buchner obtained the acid. The acid is scarcely crystalline, merely forming warty elevations. It is white, permanent in the air, odourless, very sour, and is very soluble in water, alcohol, and ether. When heated it fuses, but at the same time undergoes decomposition; but does not yield fumaric acid. From the latter acid it is distinguished by its greater fusibility and solubility; from maleic acid by its forming indistinct crystals, and not yielding fumaric acid by heat. The anhydrous acid, as found in aconitate of silver, consists of $C^4 H^1 O^3$.

Physiological Effects.—Hitherto I have met with no clear and accurate account of the effects of aconites, and some of them appear to me to have been entirely overlooked.

(*a.*) *On animals.*—If a small quantity of the soft alcoholic extract of the root of aconite be introduced into a wound (as into the cavity of the peritoneum) in a dog, it usually causes vomiting (sometimes of a stercoraceous character), diminishes the force of the circulation, weakens the muscular system so as sometimes to cause the animal to stagger in walking, and destroys common sensibility or feeling, without causing stupor. A dog under the influence of not too strong a dose, will sometimes follow its owner around the room, recognize him by wagging his tail when called, and yet be totally insensible to pinching, pricking with needles, &c. Convulsions do not usually occur until a short period before death, and they are then commonly slight, and rather to be termed spasmodic movements. I have repeatedly demonstrated these effects to the pupils attending my lectures; and they have also been witnessed by Mr. Adams, assistant-surgeon to the London Hospital. If the dose be too large, the effects are too rapid; and death succeeds in so short a period of time that the loss of feeling, as distinguished by the insensibility immediately preceding death, is not well observed. For the same reason, rabbits do not answer well for demonstrating these effects; and the weakness (paralysis?) of the hind extremities, and spasmodic movements, are much more marked in them than in dogs. I can distinguish no difference between the effects of Aconitum Napellus on rabbits and those of Aconitum ferox on the same animals (see the results of my experiments on the latter plant, in the splendid work of my friend Dr. Wallich, *Plantæ Rariores Asiaticæ;* also a detail of my experiments in the *Edinb. Journ. of Nat. and Geogr. Science*, July 1830, p. 235). On opening the bodies of dogs killed by aconite, immediately after death, no pulsations of the heart are visible.—Want of space compels me to abstain from entering into any details respecting the experiments made on animals with aconite by Wepfer (*Hist. Cic. Aq.* 1733), Sprœgel (Wibmer, *Wirk. d. Arzneim. u. Gifte.* Bd. i. S. 33), Viborg (*Ibid.* S. 34); Brodie (*Phil. Trans.* for 1811, p. 178), and Orfila (*Toxicol. Gén.*)

(*b.*) *On man.*—The *topical effects* are peculiar and most remarkable. If a leaf or a small portion of the root be chewed, or a few drops of the alcoholic tincture of the root be applied to the lips, there are produced in a few minutes numbness and a remarkable tingling sensation. These effects endure for many hours. If the quantity taken into the mouth be somewhat larger, the palate and throat are affected. To me the sensation appears as if the velum and soft palate were elongated, and rested on the dorsum of the tongue. To relieve this, frequent attempts are made to swallow.

When *small and repeated doses* of the *alcoholic tincture* of the root are taken internally, they cause a sensation of heat and tingling in the extremities, and occasionally slight diuresis.

The *extract of aconite* of the shops is but little to be relied on. Many samples produce neither numbness nor tingling when rubbed on the lips and gums. Störck (*Essay on the Int. Use of the Thorn-Apple, Henbane, and Monkshood*, Lond. 1763) states that it acts as a diaphoretic and diuretic. These symptoms, however, are by no means constantly produced, and, when they occur, are not always clearly referrible to the aconite used.

In *poisonous doses* the effects of aconite are most remarkable. The following details of the effects produced on a family of three persons were furnished me, a few days after the accident, by one of the sufferers (Mrs. Prescott), and her account was confirmed by a very intelligent neighbour who witnessed the progress of the symptoms:—

In December 1836, Mr. Prescott, aged 57, residing in the City Road, planted in his garden a few pieces of horse-radish. On February 5th, 1837, he observed some green shoots, which he supposed to be those of horse-radish. He dug up three of them. The roots (samples of which were given me, and have yielded me thriving plants of Aconitum Napellus) were tap-shaped and small. Perhaps a very small walnut would exceed in bulk that of the whole root. These roots were washed, scraped, placed on a plate with some vinegar, and eaten at dinner (at 2 o'clock) with roast beef, by Prescott, his wife (aged 57), and child (aged 5). It was remarked at dinner that the root was very mild, and had not the pungency of horse-radish. After the family had dined, about one root was left; so that two had been eaten at dinner, the greater part (perhaps one or one and a half roots) by the husband. About three-quarters of an hour after dinner, Mr. Prescott complained of burning and numbness of the lips, mouth, and throat, and which soon extended to the stomach, and was accompanied with vomiting. The matters ejected were first his dinner, and afterwards a frothy mucus; but at no time was any blood brought up. The vomiting was very violent and constant for an hour, and continued more or less until within half an hour of his death. An emetic was swallowed at a quarter past four o'clock; and, therefore, the subsequent vomiting may be ascribed, in part at least, to this. His extremities were cold, but his chest was warm: the head was bathed in a cold sweat. His eyes, to use the expression of his neighbour, were "glaring." He complained of violent pain in the head, and trembled excessively. The last symptom might, perhaps, be in part owing to his terror of the mistake he had committed. The lips were blue. His mental faculties were not disordered: on this point I made particular inquiry, and I was assured that he was neither delirious nor sleepy, but was quite conscious until within two minutes of his death. He had no cramp, spasm, or convulsion: the only approach to it was trembling. He frequently put his hand to his throat. Though exceedingly weak he did not lose his power over the voluntary muscles; for within a few minutes of his death he was able, with the assistance of his neighbour, to walk to the water-closet. His bowels were acted on once only after dinner, and that on the occasion just mentioned, which was about an hour after he had taken the emetic and some castor oil. His breathing was apparently unaffected. On his return from the water-closet he was put to bed, and within a few minutes expired, apparently in a fainting state. Death occurred about four hours after dinner.

Mrs. Prescott was affected in a similar way. She had the same burning and numbness of the lips, mouth, throat, and stomach, and violent vomiting. She experienced a curious sensation of numbness in the hands, arms, and legs; and she lost the power of articulating, so that she was unable to tell the address of her son. Her attempts to speak were attended with unintelligible sounds only. She experienced great muscular debility, and was unable to stand. In this respect her condition differed from that of her husband, who could both stand and walk. She felt stiffness of, and difficulty in moving, her limbs. She had no cramps, spasms, or convulsions. The only approach thereto was the stiffness of the muscles when she attempted to put them in action, as in her attempts to wipe her face. Some of the external senses were disordered: thus, to use her own expression, though her eyes were wide open, her sight was very dim, and surrounding objects were seen indistinctly. The hearing was unaffected. The sensibility of the body was greatly impaired; her face and throat were almost insensible to touch. She felt very giddy, but was neither delirious nor sleepy. For the most part she was conscious, but at times scarcely knew what was passing around her. Her body and extremities were cold. She was frequently pulling her throat about, but she knew not why. Five or six hours after dinner she began to recover, and her natural warmth returned. The remedies employed were an emetic, castor oil, pediluvia, rum and water, and some "warm" medicine given her by a neighbouring practitioner.

The child was similarly but more slightly affected, except that she evinced a slight tendency to sleep. Like the others she was constantly putting her hands to her throat.

Mr. Sherwen (*Lancet*, March 25, 1837, p. 13) has published a most interesting case of a female poisoned by the alcoholic tincture of the root. About five minutes after swallowing it, she was seized with a pricking and tingling down her arms and fingers, and a painful numbness across the wrists; the tongue and mouth next felt the same, then the legs and feet; and in less than ten minutes her face seemed to her feelings to be swelling and the throat growing tight. She felt sick, made many efforts to vomit. Her legs failed, she was almost blind, but was conscious of her plight. When seen by Mr. Sherwen her eyes were fixed and protruded, with *contracted* pupils; countenance livid; jaws and fauces rigid; arms and hands quite cold and pulseless; the legs and trunk much in the same state; breathing short, imperfect, and laborious; while the heart fluttered feebly. She was sufficiently sensible to tell how the accident occurred. In an attempt to administer an emetic a strong convulsion occurred. Copious vomiting afterwards took place. Five hours after she had taken the poison the pulse was becoming full, only 58 per minute, and intermitting. There was less oppression at the præcordia, and the pupils were larger. She eventually recovered.

The cases now recorded agree with the one detailed in the *Philosophical Transactions* (vol. xxxviii. p. 287). Pallas (quoted by Christison) and Degland (*Journ. de Chim.-Méd.* iii. 344) have published cases in which violent vomiting, purging, colic, and abdominal tenderness, are said to have been produced by aconite [?].

In comparing the operation of aconite with that of other cerebro-spinants we observe that its most characteristic topical effect is *numbness and tingling*. Applied to the eye it causes *contraction of the pupil*. When the root, or its tincture, is swallowed, the most marked symptoms are *numbness and tingling of the parts about the mouth and throat, and of the extremities, vomiting, contracted pupil, and failure of the circulation.* The heart appears to be weakened or paralyzed, and a state approaching to asphyxia is produced. *Convulsion* or *spasm* is not constantly present, and when it does take place, is probably a secondary effect arising from the incipient asphyxia. In neither of the cases that I have recorded, nor in that of Mr. Sherwen, did *stupor* occur. Yet in some recorded instances it has happened. In such it probably depends, as Mr. Sherwen suggests, on the congested condition of the venous system of the brain brought on by the failure of the heart's action, and the consequent accumulation of blood in the right side of the heart.

Uses.—A knowledge of the physiological effects of aconite suggests the therapeutical uses of this medicine. A benumber is obviously the physiological remedy for increased sensibility (*i. e.* pain) of the nerves.

As a *topical remedy*, aconite is most valuable for the relief of neuralgic and rheumatic pains. In *neuralgia*, no remedy, I believe, will be found equal to it. One application of the tincture usually produces some amelioration, and, after a few times' use, it frequently happens that the patient is cured. In some cases the benefit seems almost magical. In others, however, the remedy entirely fails to give any permanent relief. Though the pathology of this disease be but little understood, yet we know that the causes of it, and the conditions under which it occurs, are by no means uniform. We are, therefore, easily prepared to believe, that while in some cases aconite may prove beneficial, in others it may be useless. I do think that in any it proves injurious. The causes of neuralgia are, however, usually obscure, and therefore we are, in most cases, not able to determine *à priori* the probability or the reverse of the beneficial agency of aconite. Hence its employment must be, for the most part, empirical. I have observed, that when it succeeds, it gives more or less relief at the first application. When the disease depends on inflammation, aconite will be found, I think, an unavailing remedy. In a painful affection of the nerves of the face, arising from inflammation of the socket of a tooth, it gave no relief. In *rheumatic pains*, unaccompanied with local swelling or redness, aconite is frequently of great service. In painful conditions of the intercostal and other respiratory muscles, occurring in rheumatic individuals, I have found this remedy most valuable. In one case of *sciatica* it gave partial relief. In *lumbago* I have not tried it. Dr. Turnbull states that a lady was cured of it by the aconite ointment. In *acute rheumatism* its application has not proved successful in my hands; but I have been informed of cases occurring to others in which it has been of great service. In all the maladies here referred to, I am inclined to think that any good effects obtainable from aconite may be procured by its topical use. Dr. Turnbull has employed it internally also (see his *Treat. on Painf. and Nerv. Dis.* 1837).

Aconite has been administered *internally* in various diseases, principally on the recommendation of Störck (*Essay on the Int. Use of Thorn-Apple and Monkshood*, 1763). It has been employed as a narcotic (anodyne), sedative, sudorific, resolvent, and diuretic. The diseases in which it has been employed are *rheumatism*, *gout*, *scrofula*, *phthisis*, *syphilis*, *some skin diseases*, *scirrhus* and *cancer*, *intermittents*, *dropsies*, *paralysis*, *epilepsy*, *amaurosis*, *uterine affections*, and *hypertrophy of the heart*.

In the large majority of these maladies scarcely any practitioner now believes in its efficacy. Fouquier gave it very extensive trials without obtaining much relief from it, except as a diuretic in *passive dropsies*. In *rheumatism* it has frequently proved serviceable when combined with a sudorific regimen. In *hypertrophy of the heart* it has been recommended by Dr. Lombard (*Brit. and For. Med. Rev.* i. 249), on account of its decidedly sedative effects on the heart.

Administration.—The only preparations of aconite, whose activity may be relied on, are the *tincture* (made with rectified spirit), the *alcoholic extract*, and Morson's *aconitina*. The *powder* is given in doses of one or two grains, gradually increased, until some effects are produced. But no reliance can be placed on it. When of good quality, it causes numbness and tingling of the lips and tongue a few minutes after its application to these parts.

1. *Tinctura Aconiti*, (Root of Aconite, recently dried and coarsely powdered, lb. j.; Rectified Spirit, Oiss. Macerate for fourteen days and strain). This formula is very nearly that given by Dr. Turnbull (*Treat. on Painf. and Nerv. Dis.* p. 91, 1837). Its dose is five drops three times a day. It should be employed with great caution. As an embrocation in neuralgia and rheumatism it is invaluable. It is applied by means of a sponge tooth-brush, or a small piece of sponge attached to the end of a stick.

2. *Extractum Alcoholicum Aconiti*. (Prepared by distilling the spirit from the tincture, until the consistence of an extract has been obtained). It has been employed internally in doses of one-sixth of a grain every three hours.—It should be given in the form of pills (*pilulæ aconiti*) made of liquorice powder and syrup. It may be also employed externally in the form of ointment (*unguentum aconiti*), composed of one part of the extract, and two parts of lard (Turnbull).

3. *Extractum Aconiti*, L. E. *Succus Spissatus Aconiti*, D. (Fresh Aconite Leaves, lb. j. Having moistened the leaves with water, bruise them in a stone mortar; then press out the juice, and evaporate it, unstrained, to a proper consistence. *L. D.*—"Take of the leaves of monkshood, fresh, any convenient quantity; beat them into a pulp; express the juice; subject the residuum to percolation with rectified spirit, so long as the spirit passes materially coloured; unite the expressed juice and the spirituous infusion; filter; distil off the spirit, and evaporate the residuum in the vapour bath, taking care to remove the vessel from the heat so soon as the due degree of consistence shall be attained," *E.*) An uncertain preparation. When of good quality it causes numbness and tingling, a few minutes after its application, in the mouth and lips. The tincture or alcoholic extract are, in my opinion, greatly to be preferred to

this variable preparation. Dose, one or two grains at the commencement, and to be gradually increased until some obvious effect is produced.

4. *Aconitina*, L. The following directions for making this alkaloid are given in the London Pharmacopœia:—

"Root of Aconite, dried and bruised, lb.ij.; Rectified Spirit, *Cong.* iij.; Diluted Sulphuric Acid; Solution of Ammonia; Purified Animal Charcoal, each as much as may be sufficient. Boil the Aconite with a gallon of the Spirit for an hour, in a retort with a receiver adapted to it. Pour off the liquor, and again boil the residue with another gallon of the Spirit and the Spirit recently distilled, and pour off the liquor also. Let the same be done a third time. Then press the Aconite, and all the liquors being mixed and strained, let the Spirit distil. Evaporate what remains to the proper consistence of an extract. Dissolve this in water, and strain. Evaporate the liquor with a gentle heat, that it may thicken like a syrup. To this add of dilute Sulphuric Acid, mixed with distilled water, as much as may be sufficient to dissolve the Aconitina. Then drop in solution of Ammonia, and dissolve the Aconitina precipitated, in diluted Sulphuric Acid and water, mixed as before. Afterwards mix in the Animal Charcoal, frequently shaking them during a quarter of an hour. Lastly, strain, and solution of Ammonia being again dropped in that the Aconitina may be precipitated, wash and dry it.

Aconitina exists in the plant in combination with a vegetable acid (aconitic acid?). Alcohol extracts this salt with some other matters. The alcoholic extract yields this salt to the water, and on the addition of sulphuric acid a sulphate of aconitina is formed, which is decomposed by ammonia, and the aconitina precipitated. It is then again dissolved by sulphuric acid, the solution decolorized by charcoal, and the aconitina again precipitated by ammonia.

The physical and chemical properties of aconitina have been already described (p. 1338).

The following are the notes appended to it in the London Pharmacopœia:—

"An alkali prepared from the leaves and root of aconite. It is very soluble in sulphuric ether, less in alcohol, and very slightly in water. It is totally consumed in the fire, no salt of lime remaining. This substance possessing strong power, is not to be rashly employed."

A spurious aconitina is found in the shops. It is imported from France, and bears the stamp and label of a celebrated French chemical firm. Its colour is greyish-yellow. It is inert or nearly so; at least I have taken one grain of it without perceiving the least effect of it on the tongue or otherwise. It is not completely soluble in either ether or alcohol. When burnt on platinum foil it leaves a calcareous residue. The only genuine aconitina which I have met with is that manufactured by Mr. Morson, of Southampton-row; and Dr. Turnbull informs me that he has found none other to possess any medicinal value. Mr. Skey also found this to be the case (see *Lond. Med. Gaz.* xix. 185).

The *effects* of this alkaloid are similar to those of aconite root, but, of course, much more powerful. If the ointment or alcoholic solution of this substance be rubbed into the skin, it causes intense heat, tingling, and numbness, which continue for more than twelve or eighteen hours. A minute portion of an ointment, composed of a grain of the alkaloid to two drachms of lard, applied to the eye, causes almost insupportable heat and tingling, and contraction of the pupil. This last effect was shewn me by Dr. Turnbull, in some amaurotic cases of several years' standing, and whose pupils underwent no change when the eye was exposed to strong day-light. In very minute doses it has caused heat and tingling upon the surface of the body, and sometimes diuresis; but it cannot be administered internally with safety. In one case (an elderly lady), one-fiftieth of a grain had nearly proved fatal. Satisfied that great insecurity attends its internal use, Dr. Turnbull tells me he has long since ceased to employ it in this way, as the slightest inattention on the part of the dispenser may be attended with fatal results.

The enormous cost (3s. 6d. per grain!) of Morson's aconitina limits its use. I believe that the alcoholic tincture is a perfect substitute for it; and the experience of others confirms my own observation. Of the great efficacy of aconitina in neuralgic and rheumatic affections, no one can entertain any doubt who has submitted the remedy to trial (see Dr. Turnbull, *op. supra cit.;* Mr. Skey, *Lond. Med. Gaz.* vol. xix. p. 181). The following are Dr. Turnbull's formulæ for using aconitina externally:—

1. *Unguentum Aconitinæ. Aconitine Ointment.* (Aconitina, gr. xvj.; Olive Oil, ʒss.; Lard, ℥j. Mix).—It is employed by friction, with the finger, during several minutes.
2. *Solutio Aconitinæ. Aconitine Embrocation.* (Aconitine, gr. viij.; Rectified Spirit, ℥ij. Dissolve).—Used by friction-sponge (as a sponge tooth-brush). Care must be taken not to employ it where the skin is abraded.

Antidotes.—See the treatment for poisoning by tobacco, p. 875. In Mr. Sherwen's case (*Lancet,* March 25, 1837) great benefit was obtained by the abstraction of ten ounces of blood from the jugular vein.

Other Medicinal or *Poisonous Ranunculaceæ.*

The leaves of *Helleborus fœtidus* are emetic and purgative. They have been employed as a vermifuge against the large round worm (*Ascaris lumbricoides*).

Helleborus viridis possesses similar properties.

Aconitum ferox is, perhaps, the most violent of the ranunculaceous poisons. It is a Nepal plant, and constitutes the *Bish* or *Bikh* poison of that country. Three years since I undertook, at the request of Dr. Wallich, to examine the effects of this plant on animals. My experiments were made with plants which had been ten years in Dr. Wallich's possession, and which, therefore, had doubtless lost part of their activity: yet their effects were most energetic (see Wallich's *Plantæ Asiaticæ rariores;* and the *Edinb. Journ. of Nat. and Geogr. Science,* July 1830, p. 235).

II. SUBREGNUM ANIMALE.—THE ANIMAL SUB-KINGDOM.

DIVISION I. INVERTEBRATA.—INVERTEBRAL ANIMALS.

Animals destitute of a *vertebral column* and an *internal skeleton*. *Skin* sometimes ossified, and thereby forming an *external skeleton*. *Nervous system* not always evident.

SUBDIVISION I. ACRITA, *Macleay*.

Nervous system indistinct, diffused, or molecular, (Owen, *Cyclop. of Anat.* art. *Acrita*.)

CLASS 1. PORIPHERA, *Grant*.—PORIPHEROUS ANIMALS.

Simple, soft, aquatic *animals*, with a fibrous *axis*, without perceptible *nerves* or *muscular filaments*, or *organs of sense*, or any *circulating* or *glandular organs*. Their body is composed of a soft gelatinous *flesh*, traversed internally with numerous, ramose, anastomosing canals, which commence from superficial minute *pores*, and terminate in larger, open *vents* (Grant, *Brit. Annual*, for 1838, p. 267).

Spon'gia officina'lis, Linn. E. D.—*The Officinal Sponge.*

(Sponge, *E.*)

HISTORY.—Aristotle (*Hist. de Anim.* lib. i. cap. ix. p. 16, Tolosæ, 1619) was acquainted with the sponges, and notices the popular but erroneous opinion of their shrinking when attempted to be plucked.

ZOOLOGY. *GEN. CHAR.*—Body soft, very elastic, multiform, more or less irregular, very porous, traversed by numerous tortuous canals which open externally by very distinct vents (*oscula*), and composed of a kind of subcartilaginous *skeleton*, anastomosed in every direction, and entirely without spicules (De Blainville, *Man. d'Actinol.* p. 529, 1834).

SP. CHAR.—*Masses* very large, flattened and slightly convex above, soft, tenacious, coarsely porous, cracked and lacunosè, especially beneath. *Vents* round, and for the most part large (Lamouroux, *Hist. des Polyp. Corall.* p. 20, 1816).

Sponge adheres to rocks by a very broad base. When first taken out of the sea it has a strong fishy odour. Its colour varies from pale to deep brownish yellow. It often contains stony or earthy concretions (*lapides spongiarum*) which Bley (*Pharm. Centr.-Blatt. für* 1834, S. 273) found to consist principally of the carbonates of lime and magnesia. Shells also are found in sponges. Various marine animals pierce and gnaw it into irregular holes. The animal nature of sponge is by no means universally admitted; indeed a considerable number of the naturalists of the present day regard it as of vegetable origin (see Mr. Hogg's observations on this subject, in the *Linn. Trans.* vol. xviii. p. 363 and 368). If vegetable, its position, in a natural classification, will be between Algæ and Fungi.

HAB.—In the Red and Mediterranean Seas. Chiefly collected about the islands of the Grecian Archipelago.

COLLECTION.—The inhabitants of the Greek islands collect sponge by diving for it. In their submarine operations they carry with them a knife. Practice enables them to remain a considerable time under water

(Savary, *Letters on Greece*, p. 109, Lond. 1788). As soon as the sponge is brought on shore, it is squeezed and washed to get rid of the gelatinous matters, otherwise putrefaction speedily ensues.

Description.—Commercial sponge (*spongia*) is the dry skeleton of the animal, from which the gelatinous flesh has been removed, as just mentioned. When deprived of stony concretions, &c. found in the interior of the mass, it is soft, light, flexible, and compressible. When burnt it evolves an animal odour. It absorbs water, and thereby swells up. Nitric acid colours it yellow. Liquor potassæ dissolves it: the solution forms a precipitate on the addition of an acid. The finer sponges are those which have the greatest firmness and tenacity. *Turkey sponge* is the most esteemed kind: *Bahama sponge* is of very inferior quality. To whiten sponge it is sometimes bleached.

Composition.—Well-washed sponge, freed as much as possible from earths and salts by dilute acids, was analysed, in 1828, by Hornemann (*Berl. Jahrb.* Bd. xxx. Abt. ii.), who found it to consist of *a substance similar to osmazome, animal mucus, fat oil, a substance soluble in water, a substance only soluble in potash, and traces of chloride of sodium, iodine, sulphur, phosphate of lime (?), silica, alumina, and magnesia.* Mr. Hatchett (*Phil. Trans.* for 1800, p. 327) found sponge to consist of *gelatin*, (which it gradually gave out to water), and a thin, brittle, membranous substance, which possessed the properties of *coagulated albumen.*

Uses.—The extensive economical uses of sponge are familiar to every one. To the surgeon it is of great value on account of its softness, porosity, elasticity, and the facility with which it imbibes fluids. Its use at surgical operations is well known. It has also been applied to wounds and ulcers for imbibing acrid discharges. The *sponge-tent* (*spongia cerata*), prepared by dipping sponge into melted wax, and compressing between two iron plates till the wax hardens, was formerly much used for dilating sinuses and small openings, but it is seldom resorted to now.

Spongia usta. *Pulvis spongiæ ustæ*, D. *Calcined* or *burnt sponge.*—(Having cut sponge into pieces, beat it to free it from little stones; burn it in a closed iron vessel until it becomes black and friable, and reduce it to powder, *D*). Preuss (*Pharm. Centr. Blatt. für* 1837, 169) calcined 1000 parts of sponge: of these, 343·848 parts were destroyed by heat. The residue consisted of *carbon* and *siliceous insoluble matters*, 327·0; *chloride of sodium*, 112·08; *sulphate of lime*, 16·430; *iodide of sodium*, 21·422; *bromide of magnesium*, 7·570; *carbonate of lime*, 103·2; *magnesia*, 4·73; *protoxide of iron*, 28·720; and *phosphate of lime*, 35·0.—Burnt sponge, when good, should evolve violet fumes (*vapour of iodine*) when heated with sulphuric acid in a flask. It has been employed as a resolvent in bronchocele, scrofulous enlargement of the lymphatic glands, &c. Its efficacy is referrible to iodine and bromine. Iodine is now almost invariably substituted for it. Dose, ʒj. to ʒiij. It is given in the form of electuary or lozenges, (*trochisci spongiæ ustæ*).

Class 2. Polypiphera, *Grant.*—Polypipherous Animals.

Fig. 242.

Corallium rubrum.

The polypipherous animals have received their name from the circumstance of their bearing tubes called *polypes*. They consist of two parts, a skeleton and a fleshy portion. The *skeletons* vary in their consistence, and also in their position relatively to the soft parts. They are soft and flexible, or hard and calcareous. They are external and tubular, or internal and solid. The *fleshy portion* may be, with respect to the skeleton, either external or internal. It gives origin to fleshy tubes (*polypes*), each of which, at its external orifice, is surrounded by *tentaculæ*.

The calcareous internal skeleton of *Corallium rubrum*, Lamarck (*Isis nobilis*, Pallas; *Gorgonia pretiosa*, Ellis), is the *Red Coral* of the shops. It consists of carbonate of lime principally coloured with oxide of iron. It was formerly used in medicine, but it presents no advantage over chalk. Its powder, obtained by levigation, or an imitation of it, is still kept in the shops, and is occasionally employed as a dentrifice.

Subdivision 2. RADIATA, *Lamarck.*—RADIATE ANIMALS.

Nervous system distinct, composed of filaments and rudimentary ganglia; the filaments arranged circularly around the buccal orifice (*Cyclo-neura*).

No officinal substance is obtained from the Radiata.

Subdivision 3. MOLLUSCA, *Latreille.*—MOLLUSKS or SOFT ANIMALS.

Malacozoa, *Blainville.*—Cyclo-gangliata, *Grant.*

Inarticulated animals with a soft not annulated *skin*. *Cerebral ganglia* arranged circularly around the œsophagus.

Class 3. Conchifera, *Lamarck.*—Conchiferous Mollusks.

Acephalous, aquatic mollusks, with a bivalve or multivalve *shell*. *Organs of respiration* four pectinated laminæ. *Heart* simple. *Impregnation* effected without the assistance of a second individual.

Os'trea edu'lis, Linn. L.—*Common Edible Oyster.*

(Testæ, *L.*)

History.—Oysters were greatly admired by the Romans as a most delicious article of food (Pliny, *Hist. Nat.* lib. xxxii. cap. 6, ed. Valp.) Those of Britain were much esteemed (Juvenal, *Sat.* iv.); though they were said to be inferior to those of Cyzicena (Pliny).

Zoology. *Gen. Char.*—*Body* compressed, more or less orbicular. Edges of the *mantle* thick, non-adherent or retractile, and provided with a double row of short and tentacular filaments. The two pair of *labial appendices* triangular and elongated. A subcentral, bipartite *muscle*. *Shell* irregular, inequivalved, inequilateral, coarsely laminated. *Left or inferior valve* adherent, largest and deepest; its summit prolonged, by age, into a kind of heel. *Right or upper valve* smallest, more or less operculiform. *Hinge* oral, toothless. *Ligament* somewhat internal, short, inserted in a cardinal pit, growing with the summit. The *muscular impression* unique and subcentral (Blainville).

Sp. Char.—*Valves* ovate-roundish or obovate; the upper one flat. *Lamellæ* of both valves, imbricated and undulated (Brandt, *Med. Zool.*)

Brandt (*Ibid.* Bd. ii.) has given an elaborate account of the anatomy of the oyster, to which I must refer the student interested in these details.

Hab.—European and Indian Seas. Our own coasts furnish some of the finest kinds. Those found at Purfleet are said to be the best.

Oyster Fisheries.—Oysters are caught by dredging. In order to improve their flavour and size they are laid on beds in creeks along shore, where they rapidly improve. Colchester and other places of Essex are the nurseries or feeding grounds for the metropolis. (For details respecting the treatment of oysters in beds, see Spratt's *Hist. of the Royal Society*, p. 307).

Description.—The officinal parts of oysters are the *shells* (*testæ ostreæ*). The hollow valves are preferred, as they contain more carbonate of lime. These, when freed from impurities, by washing, boiling, and crushing, are dried and ground to an impalpable powder, which, after being submitted to the process of elutriation, is usually made up into small conical masses, called in the shops *prepared oyster shells* (*testæ præparatæ*, Ph. L ; *testæ ostreæ præparatæ*). When calcined, oyster shell yields a quicklime formerly much esteemed as a lithontriptic.

Composition.—*Oyster shells* have been analyzed by Bucholz and Brandes (Gmelin, *Handb. d. Chem.* ii. 1477), and by Rogers (*Silliman's Journ.* vol. xxvi. p. 361).—The *flesh of the oyster* has been analyzed by Pasquier (Gmelin, *op. supra cit.*)

Bucholz and Brandes's Analysis.

Carbonate of lime	98·6
Phosphate of lime	1 2
Alumina	0·2
Albuminous matter	0·5
Oyster shells	10.05

Pasquier's Analysis.

Osmazome, Gelatine, Mucus, Albumen, Fibrine	12·6
Water	87·4
Flesh of the oyster	100·0

Physiological Effects and Uses.—Prepared oyster shells consist almost solely of carbonate of lime, and possess the same medicinal properties as prepared chalk (see p. 356), which is now almost universally substituted for them.

The flesh of the oyster furnishes a delicious article of food. It is more digestible in the raw state than when cooked (by roasting, scolloping, or stewing); for the heat employed coagulates and hardens the albumen which is then less easily soluble in the gastric juice; and the heated butter adds still more to the indigestibility of the dish. As far as my own observation extends, the finest raw oysters of the London market (usually called *natives*) rarely disagree even with dyspeptics; and Dr. Cullen (*Mat. Med.*) declares oysters easy of digestion. Very different, however, are the statements of some writers (Pearson, *Pract. Synops. of the Mat. Alim.* 1808). Poisonous effects even have been ascribed to oysters (Christison, *Treat. on Poisons*). Considering the enormous consumption of those animals, their supposed ill effects must be of extremely rare occurrence. The statement of Dr. Clarke (*Trans. of the Lond. College of Phys.* vol. v. p. 109), that oysters taken immediately after delivery are apt to occasion apoplexies or convulsions, appears highly improbable. An aphrodisiac property is usually ascribed to oysters. These animals have been recommended in phthisis, and also in some abdominal affections.

During the spawning season (May, June, and part of July) oysters are unfit to be used as articles of food.

CLASS 4. CEPHALOPODA, *Cuvier.*—CEPHALOPODS.

Body inclosed in a bag (*mantle*). *Head* protruding from the bag, crowned with inarticulated arms, furnished with cups or suckers, and surrounding the mouth. *Eyes* two, sessile. *Mouth* with two horny mandibles. *Hearts* three. *Sexes* separate.

SEPIA OR CUTTLE FISH. The substance called *os sepiæ* or *cuttle-fish bone* is an oval or oblong calcareous bone (sometimes termed a *shell*) deposited in the mantle of the animal. The common species of sepia is *S. officinalis*, Linn.; but *S. elegans*, Blainville, also yields part of the cuttle-fish bone of the shops (Brandt and Ratzeburg, *Med. Zoolog.* ii. 299).

Os sepiæ has a cellular texture, and is so light as to float on water. It is cast in considerable quantities on the shores, and is collected for commercial purposes. It was analyzed by John, who found the contituents to be as follows:—

	Hard, Upper or Outer Portion.	Porous Part.
Carbonate (with a trace of phosphate) of lime......	80	85
Non-gelatinous animal matter, soluble in water with some common salt	7	7
Gelatinous membrane, not soluble in water	9	4
Water, with a trace of magnesia	4	4
	100	100

Reduced to powder it is used as a dentrifice. It is employed for several purposes in the arts, as for polishing, for forming moulds for small silver castings, and as a pounce.

SUBDIVISION IV. ARTICULATA, *Cuvier.*—ARTICULATED ANIMALS.

Skin annulated. *Muscles* attached to the inner surface of the skin. *Nervous system* of two cords extended along the ventral surface of the body, with ganglionic enlargements at intervals (*diplo-neura*); the anterior ganglion (brain) placed over the œsophagus.

CLASS 5. ANNULOSA, *Macleay.*—ANNULOSE ANIMALS.

ANNELIDES seu ANNELIDA.

Body more or less elongated. *Skin* soft, segmented and annulated. *Articulated members* and *wings* absent. *Blood* red.

Sanguisu'ga, Savigny.—*The Blood-sucking Leeches.*

Iatrobdella, *Blainville.*

HISTORY.—We have no accurate knowledge as to the exact period when leeches either became known to, or were employed by, man; but this deficiency of information is not necessarily referrible to their discovery preceding the date of our historical documents. It is true that in the common version of our most ancient record, the Bible (*Prov.* xxx. 15), this passage occurs, "The horse-leech hath two daughters, crying, give, give;" but critics are not agreed as to the correctness of this translation. The word ‘*Olukeh*,” or “*Aluka*,” here interpreted “*horse-leech*,” means, according to Bochart, destiny or fate, either of which terms should, according to this writer, be substituted for that of horse-leech; the daughters alluded to being Eden and Hell. But the Vulgate, Greek, and Lutheran translations, are all against his opinion. Brandt (*Med. Zool.* ii. 231) has entered into a very elaborate discussion of this subject, from which it appears that, in Arabic, the term *Aluka* indicates a leech, while *Aluk* signifies fate; the latter being derived from *Alaka*, to attach or hang to, because every man's fate is supposed to be appended to him, just as a leech affixes itself to the body; so that from this it appears probable the word "*Olukeh*," of the Old Testament, really refers to leeches. Nay, I think there is some reason for suspecting that the *Sanguisuga ægyptiaca* is the species referred to. The leeches referred to by Herodotus (*Euterpe*, lxviii.) are *Bdella nilotica* (Savigny).

But admitting that these animals were known at this early period, it does not appear that they were employed in medicine: for Hippocrates makes no mention of them, though he notices other modes of drawing blood. Aristotle also is silent with regard to them. In the extracts which Cælius Aurelianus has made from the writings of Diocles, Praxagoras, Herophilus, Heraclides, Asclepiades, and other ancient physicians, who lived between the time of Hippocrates and Themison, no mention is made of the employment of leeches; a remarkable fact in favour of the opinion that they were not at this period in use. In fact, the founder of the methodic sect, Themison, is the first person in whose works we find mention of leeches being employed therapeutically (Le Clerc, *Hist. de la Medic.* p. 442, Nouv. ed. 1729). However, it does not follow that he was the first who prescribed them, though our documentary evidence fails in tracing back their use beyond him.

In the Latin and Greek languages, the animal has received its name from its sucking or drawing qualities. Thus the Greeks called it βδέλλα, from βδέλλω, to suck; the Romans *hirudo*, probably from *haurio*, to draw out; or *sanguisuga*, literally signifying "a blood-sucker," from *sanguis* and *sugo*. It would appear, however, that the latter of these two Latin terms is the more modern; for Pliny (*Hist. Nat.* viii. 10. ed. Valp.) in speaking of elephants, says, "Cruciatum in potu maximum sentiunt, hausta hirudine, quam sanguisugam vulgo cœpisse appellari adverto."

ZOOLOGY. *GEN. CHAR.*—*Jaws* with two rows of pointed, numerous *teeth*, which are mutually inclined at an acute angle, (Brandt, *Med. Zool.* ii. 231.)

Body elongated. *Back* convex. *Belly* flat. *Extremities* somewhat narrowed, furnished with disks or suckers; the anterior extremity somewhat narrower than the posterior one. *Rings* from ninety to a hundred. *Eyes* represented by ten blackish points. *Mouth* tri-radiate. *Jaws* cartilaginous, armed with numerous cutting teeth. *Anus* small, placed on the dorsum of the last ring.

Cuvier (*Règne Animal*, t. iii. p. 212, nouv. éd. 1830) includes all leeches in the genus *Hirudo*; but later naturalists have found it necessary to arrange them in several genera. The leeches employed in medicine have been formed into a distinct genus, called by Blainville (*Dict. des Scien. Nat.* t. 47, art. *Sangsue*) *Iatrobdella* (from ἰατρὸς and βδέλλα, *a leech*), by Savigny (*Desc. de l'Egypte, Hist. Nat.* t. 1er. part. 3e. p. 114), *Sanguisuga*. The latter classical term, so expressive of the blood-sucking properties of the genus, I have adopted. All leeches, it appears, are not provided with an apparatus for perforating the skin of vertebrate animals. In consequence of the numerous complaints addressed to the Prefet de Police, in 1825, that of the leeches sold in Paris some would not bite, while others caused painful and obstinate wounds, he consulted the Conseil de Salubrité, who deputed MM. Pelletier and Huzard fils, to inquire into the accuracy of the statements

One of the results of the investigation was, that the animal called in France *horse-leech*, and which had been particularly charged with causing painful wounds, could not perforate the human skin, the teeth of the animal being quite blunt, (*Journ. de Pharm.* t. xi). The horse-leech referred to, the reporters declared to be *Hæmopis sanguisorba*, Savigny; but Blainville says it is *Hæmopis nigra*.

Species.—1. Sanguisuga officinalis, Savigny. *Hirudo provincialis* Carena, Mém. della Reale Accad. di Torino. xxv. 282; *Sanguisuga meridionalis*, Risso, Hist. Nat. de l'Europe mérid. iv. 428; *the Green Leech.*—*Back* greenish or blackish-green, with six rusty red, bandlike [longitudinal] stripes. *Belly* olive-green, unspotted (Brandt).—South of Europe. Those brought to England come from Bourdeaux, Lisbon, and Hamburgh.

Moquin-Tandon (*Monogr. de la fam. des Hirud.* p. 112) admits three varieties:—

α. Dorsal bands interrupted at intervals.
β. Dorsal bands reduced to blackish spots.
γ. Dorsal bands united by transverse ones.

2. Sanguisuga medicinalis, Savigny. *Hirudo medicinalis*, Linn. L. D. *True English* or *Speckled Leech.*—*Back* greenish or olive-green, with six rusty red longitudinal stripes, which are mostly spotted with black. *Belly* greenish-yellow, spotted with black (Brandt.)—*Spots* very variable in size and number; in some cases they are but few; in others are so numerous as to form the almost prevailing tint of the belly, the intervening spaces appearing like greenish yellow spots.—Europe, especially the northern parts. A native of England, but rare. Imported from Hamburgh.

Several varieties of this leech have been described and figured. One of the most remarkable of these is the *flesh-coloured medicinal leech* (*Sanguisuga medicinalis carnea*) described by Guillez of Paris. The anterior half of its body is flesh-coloured; while the posterior half is of the usual colour. The *spotted* or *piebald leech* is flesh-coloured with olive-green spots (see Brandt and Ratzeburg, *Med. Zool.*)

These are the only species employed in medicine in this country. Others have been described and figured by Brandt (*Med. Zool.* ii). The following is a short sketch of the *anatomy* of the medicinal leech:—

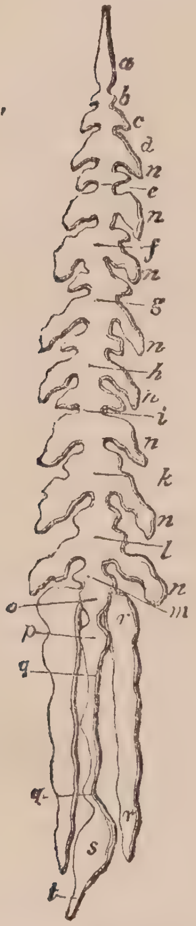
The Cutaneous System of the animal consists of a transparent *epidermis* (which is thrown off from the body every four or five days) and the *corium*. The latter consists of condensed cellular tissue, composed, according to Brandt, of globules. Like the epidermis, it shews the partitions into rings. It contains a number of *globules* impregnated with a pigment, varying in colour in different places, and which is the source of the colours presented by the surface of the animal.

It is asserted that the predominant or base colour is, in part at least, owing to the colour of the soil in which the animals are found. Dr. J. R. Johnson (*Treat. on the Med. Leech*, p. 42, 1816) says, "Mr. Baker, a man of some intelligence, residing in Glastonbury, and who for the last twenty years has been in the habit of collecting large quantities of leeches for sale, informs me that at the Black River, near Glastonbury, they are black, from the peat being of that colour; at Cook's Corner, they are of a reddish cast, from the red peat; while at Auler Moor, where, from a deficiency of peat, they penetrate the clay, they are yellow."

The Muscular System has been elaborately described by Brandt, but can scarcely be comprehended without the aid of drawings. The muscles of the trunk are arranged circularly, longitudinally, and obliquely: of these, the circular fibres are the most external, and the longitudinal ones the most internal.

The DIGESTIVE SYSTEM consists of a mouth, alimentary tube, anus, salivary glands, and liver. The *mouth* is placed in the middle of the oval or buccal disk; its shape is triradiate,—that is, of three equidistant lines or rays meeting in a centre. Within it are three white sublenticular *jaws* (*dentiferous tubercles* or *piercers*), which in appearance are cartilaginous; but Brandt says they consist of a strong firm skin, inclosing a muscular mass. On the free-curved sharp margin of each jaw are about sixty small, finely-pointed *teeth*. The *œsophagus* is a muscular tube, and dilates as it approaches the stomach; but at its termination it contracts into a small circular aperture, its whole length not exceeding a quarter of an inch. The *stomach* occupies two-thirds of the length of the animal, and is divided into about eleven compartments or cells, each of which, from the second to the eleventh, gives off on each side a *cæcal sac*, those of the last cell being far the largest, and extending down by the side of the intestine as far as the commencement of the rectum. The stomach consists of three coats,—a cellular, a muscular, and a mucous one. Its eleventh cell terminates by a funnel-shaped projection in the intestine. The *intestine* is about an inch in length; at its upper orifice is a valve, and at its lower end a sphincter: on either side of it, for the greater part of its length, is one of the sacs of the last compartment of the stomach; on its inner surface are several folds. It is divided into *small* and *large intestine*, the lower part of the latter being called a *rectum*. The *anus* is not, as we might anticipate, in the posterior disk, but on the dorsal surface of the last ring. *Salivary organs* have been described; they consist of whitish granular masses placed around the œsophagus, into which tube the common salivary duct opens. De Blainville, Carus, and Brandt, speak of a *liver*. It is a brownish mass placed on the alimentary canal, the ducts opening into the stomach and intestine. The best mode of displaying the cells of the stomach is to immerse a leech, fully gorged with blood, for a week in a saturated solution of corrosive sublimate.

FIG. 243.



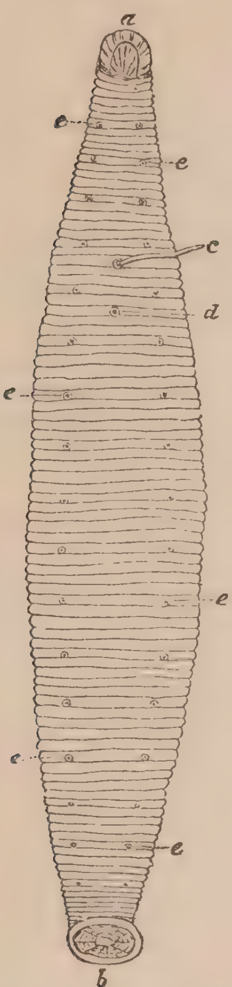
Alimentary Canal of the Leech.

a, Œsophagus.
b, *c*, *d*, *e*, *f*, *g*, *h*, *i*, *k*, *l*, *m*, Cells of the stomach.
n, Cæcal sacs.
o, Funnel-shaped pylorus.
p, Irregularly expanded commencement of (*q*) the small intestine.
r, Cæcal sac of the last cell of the stomach.
s, Large intestine.
t, Rectum.

The VASCULAR SYSTEM consists of four great pulsating *vessels*, giving off numerous ramifying branches; but without any heart, commonly so called. Two of these are placed laterally, a third in the median line of the dorsal surface, and a fourth on the abdominal surface. All these vessels pulsate (Johnson). We know very little about the manner in which the blood circulates. Brandt thinks that the lateral vessels must be arteries, on account of their very distinct transverse and longitudinal muscular fibres; the dorsal and venous vessels he terms veins, (*Med. Zool.* t. ii. 249). Does not the dorsal vessel correspond to the vena cava, and the abdominal vessel to the vena porta of higher animals? Grant (*Outl. of Comp. Anat.* 440), however, terms the dorsal vessel of the annelides an artery. (Some interesting observations on the vascular system of leeches are contained in Knolz's *Nat. Abhandl. ü. d. Blutegel*, Wien, 1820).

The RESPIRATORY SYSTEM consists of small apertures (called *stigmata* or *spiraculæ*) arranged in two rows on the abdominal surface, and occurring at every fifth ring. They lead into little cavities lined by mucous membrane, and which have been called *air sacs, pulmonary vesicles, mucous bags, cryptæ*, or *lateral vesicles*, containing usually a whitish fluid. They are placed on each side of the alimentary canal, in the spaces between the cæcal sacs of the stomach, and are usually regarded as organs of respiration. Brandt, however, asserts that the respiratory function is effected solely by the skin, and that these vesicles are, in fact, receptacles for mucus secreted by a neighbouring *glandular apparatus*, which has a whitish appearance, and in form represents a folded intestine. This notion, however, is not new, but was held by De Blainville and Johnson.

FIG. 244.



Ventral Surface of the Leech.
a, Anterior disk.
b, Posterior disk.
c, Penis.
d, Vaginal orifice.
e, Stigmata.

The NERVOUS SYSTEM consists of two parts: *one* (which we may compare to the *cerebro-spinal axis* of the vertebrata) consists of a chain of ganglia (usually about twenty-three in number) occupying the mesial line of the abdomen, and connected by a double nervous cord; the first ganglion (*brain*) is placed on the œsophagus, and supplies the eyes and neighbouring muscles. The *second* part of the nervous system is that lately discovered by Brandt, and may be regarded as a kind of *sympathetic system*. It consists of three ganglia (connected to the brain by filaments, and supplying the jaws), and a single nerve connected to them, and running along the abdominal surface of the stomach in the mesial line.

Of the EXTERNAL SENSES three only have been recognized: *feeling*, which resides in the external surface of the body; *taste*, apparently indicated by the fondness of leeches for certain fluids (as blood, milk, &c.); and *vision*, effected by ten eyes (in the form of black spots) arranged in a crescent form at the anterior or cephalic extremity of the animal.

The SEXUAL SYSTEM is double,—that is, each animal is androgynous, or possesses both male and female organs. There is, however, no power of self-impregnation (the contact of two individuals being requisite, each acting to the other in a double capacity of male and female). The *MALE ORGANS* consist of several pairs of *testicles, two vasa deferentia, two vesiculæ seminales, two ejaculatory ducts*, and a *penis* surrounded at its base by what some have termed a *prostate gland*. The penis projects from the abdominal surface at about one-third distant from the anterior extremity. The *FEMALE ORGANS* consist of *two ovaries, two oviducts* (which subsequently unite into one), a hollow organ (*uterus*) which opens by a contracted aperture (*vagina*) externally, at about the twenty-ninth ring, or five rings below the penis.

That leeches are essentially oviparous admits of no doubt; and we have now an admirable account of their development by Professor Weber (*Meckel's Archiv* for 1828, p. 366). It appears that soon after copulation an unusual activity pervades the ovaries, in consequence of which some *ova* (termed by Weber *germs*, by Carus *yelks*) are separated, and pass along the oviduct to the uterus, where they stop, in order to obtain the matters necessary for their development, and their proper coats. They here become invested with a serous-like membrane, on the inner side of which is produced (either by secretion from the uterine cavity or from the membrane itself) an albuminous whitish mucus, serving in part for the nourishment of the ova, and which is regarded as a kind of *liquor amnii*. Subsequently a glutinous fluid is deposited on the outside of the serous coat. When the ova are expelled from the uterus, part of this fluid gives a coating to them, while part is expelled before and after them. But this coat seems now distended with air vesicles, and has the frothy appearance of well-beaten white of egg, probably produced by the violent contraction of the uterus.

The animals usually deposit their ova (in their own native waters) in holes or moist places on the shore, usually from May to the end of September. When first expelled, they are somewhat cylindrical in their form, and have a brownish appearance. The frothy layer adheres very slightly; but after lying in the water for a quarter of an hour, the outer surface becomes somewhat hardened, forming a kind of pellicle or fine skin. After some days a portion of this frothy covering is converted into a spongy tissue (*spongy coat of the cocoon*), covering the capsule of the ova (*cocoon*) wholly or partially. In this state the cocoon has a brownish, fibrous appearance, similar to fine sponge, and varies somewhat in its size and weight; its longest diameter being from six to twelve lines, its shortest from five to eight, and its weight from twenty-four to twenty-eight grains. (See figures of the cocoon in Dr. J. R. Johnson's *Furth. Observ. on the Med. Leech,* 1825).

FIG. 245.

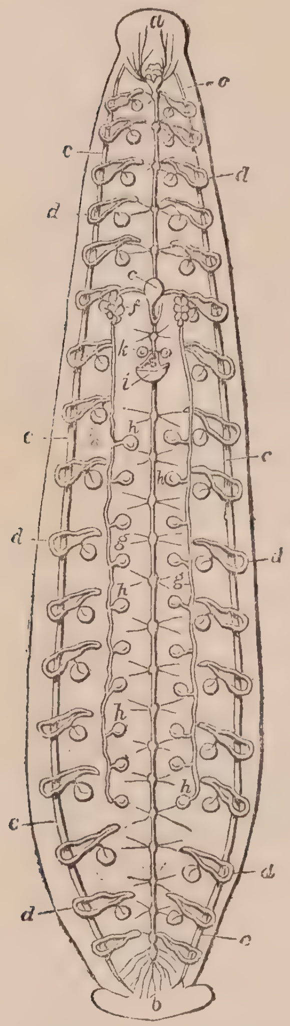


Diagram illustrative of the internal anatomy of S. medicinalis.

a, Brain.
b, Last ganglion.
Between these will be observed the chain of ganglia of which they form portions.
c, Lateral or branchial vessels.
d, Folded mucous glands; each is connected by a duct to an air vesicle.
e, Penis, the rounded enlarged base of which is supposed to contain the prostate gland.
f, Vesiculæ seminales.
g, Vasa deferentia.
h, Testicles.
i, Uterus.
k, Ovaries.

The ova or germs, which have a lenticular form, enlarge, and evince vital movements; and very soon we perceive on each a funnel-shaped tube, extending from their surface inwards, and which appears to absorb the albumen of the cocoon. The ovum goes on enlarging, and becomes somewhat elongated, and subsequently the young leech begins to be developed on the exterior part of the ovum, the aperture of the funnel being the spot where the mouth of the young animal is observed. The abdominal surface is the first, the dorsal the last, to become developed. When the young leeches have attained a considerable size they pierce their cocoon.

DISEASES OF LEECHES. — The natural duration of the life of leeches is not easily determined; but judging from the slowness of their growth, and the length of time full-grown leeches have been preserved, we may necessarily infer that they are long-lived animals. Dr. Johnson thinks that in their native waters, if they can always meet with an abundant supply of food, they may live at least twenty years. But they are subject to several diseases, some of which are epidemic, and of a very destructive kind. Although the study of the pathology of this animal is of considerable interest in a commercial and even scientific point of view, yet no practically useful results have hitherto been arrived at in regard to the prevention and treatment of the diseases of leeches. Dr. J. R. Johnson mentions three diseases as common to this animal:—1st. An ulcer, seated in various parts of the body, but more generally affecting the side. It destroys life in a few days. 2dly. A rigidity and narrowing of one part, whilst another portion is studded with tumors of putrid coagulated blood. 3dly. A flaccid appearance of the whole body, except the lips, which are hard, swollen, purple, and frequently bloody. These diseases are particularly prevalent during the summer months. Brostat (*Brandes's Archiv.* Bd. v.) describes three epidemic disorders.

COLLECTION AND COMMERCE OF LEECHES.—Leeches may be caught with the hand, or by a kind of net (described by Derheims), or by the gatherers going into the ponds with naked feet, to which the leeches adhere; or by baits, especially the liver of animals. The two latter methods are objectionable,—one because it is not free from danger to the gatherers, and the other because the bait is apt to injure the health of the animal. An interesting and graphic account of the leech fishery at La Brenne, and of the miserable appearance of the fisherman who collects the leeches, by allowing them to attach themselves to his legs and feet, has been published in the *Gazette des Hôpitaux*. A translation of this paper is given in Macculloch's *Dict. of Commerce.*

All our leeches are imported from Hamburgh. The Hamburgh dealers draw their supplies from the Ukraine. "Having exhausted all the lakes of Siberia, Bohemia, and other more frequented parts of Europe, the buyers are now rolling gradually and implacably eastward, carrying death and desolation among the leeches in their course—sweeping all before them, till now they have got as far as Pultava, the pools and swamps about which are yielding them great captures." (Bremner, *Excurs. in the Interior of Russia*, vol. ii. p. 408, 1839.)

Leeches are sometimes imported in bags, but more usually in small barrels, each holding about 2000, the head being made of stout canvas to admit the air. The best vessels for preserving these animals are unglazed brown pans or wooden tubs. The dealers have a notion (and possibly a correct one) that the leaden glazing is injurious. These pans should be very little more than half filled with soft water (pond, river, or rain water). This does not require changing so often as is commonly supposed. In very hot weather, or when the water has become bloody, or otherwise much discoloured, it should be changed every day or so; otherwise, in summer every four or five days or a week; in winter, once a month is believed, by large dealers, to be sufficient.

The *consumption of leeches* must be enormous. Some years ago it was stated that four principal dealers in London imported, on the average, 600,000 monthly, or 7,200,000 annually (Price, *Treat. on Sanguisuct.* p. 129, 1822). Feé (*Cours d'Hist. Nat.* t. i. p. 21) says, "it is estimated that 3,000,000 are annually consumed in Paris; and as the population of Paris is to that of the whole of France as one is to thirty-three, it follows that, independently of exportation, 100,000,000 are consumed annually, which is equivalent to three leeches annually for each person. Now, if we estimate the average price at fifty francs per thousand, we shall have the enormous sum of five millions of francs paid for this one article of our materia medica."

MODE OF BITING.—Having fixed on a suitable spot, the animal applies his oval disk, and firmly fixes it (at first, perhaps, by atmospheric pressure; then by intimate contact), so that the anterior end forms an angle with the other portions of the body. The three cartilaginous jaws bearing the sharp teeth are now stiffened and protruded through the tri-radiate mouth against the skin, which they perforate, not at once, but gradually, by a saw-like motion. Dr. Johnson (*Treat.* p. 112), says, "The jaws are carried from side to side in an oblique direction;" and adds, "their action may be seen by presenting to the leech a coagulum of blood, and when the leech is in the act of suction, cautiously removing it. For a few seconds it appears unconscious of its removal, which presents a fair opportunity of observing the oscillatory movement of each piercer." The wound is not produced instantaneously, for the gnawing pain continues for two or three minutes after the animal has commenced operations. Thus, then, it appears that the leech saws the skin: hence the irritation and inflammation frequently produced around the orifices. The flow of blood is promoted by the suction of the animal, who swallows the fluid as fast as it is evolved. During the whole of the operation the jaws remain lodged in the skin. In proportion as the anterior cells of the stomach become filled, the blood passes into the posterior ones; and when the whole of this viscus is distended, the animal falls off. On examination it will be found that not a particle of blood has passed into the intestine.

Physiological Effects.—There are two classes of phenomena observed in all modes of drawing blood; one of which has been termed *local*, the other *general*. In phlebotomy and arteriotomy, the first is trifling, and of no therapeutic value; and we resort to these operations only as means of affecting the general system. On the other hand, we obtain topical effects, both powerful and useful, from cupping and leeching; hence these are termed *local*, while the former are denominated *general* blood-lettings. It must, however, be remembered, that constitutional or general effects are also frequently obtained from both cupping and leeching.

1. *Constitutional or general effects of leeching* are the same in kind as those caused by the loss of blood from other means. A moderate quantity of blood may be abstracted without any obvious effects on any of the functions; but if the amount taken be increased syncope results. The quantity necessary to produce this varies, however, considerably, and will depend on the mode of drawing it, (whether rapidly, or otherwise); the position, constitution, and age of the patient; the nature of the disease; and many other circumstances not necessary to enumerate. It is well known that a small quantity will, if taken rapidly, and the patient be in the erect posture, cause this effect; whereas a considerably larger amount may be abstracted, if taken gradually, and the patient in the recumbent position, without giving rise to it. The usual explanation of this is, that when the blood is drawn faster than the vessels can contract, the circulation is temporarily stopped, and fainting ensues. Several reasons, however, lead me to doubt the sufficiency of this explanation. Leeching, then, as being a slower mode of abstracting blood, is less likely to cause syncope than venesection, or even cupping. As the patient recovers from the fainting state, hysterical symptoms sometimes manifest themselves. Throbbing headache, and sleeplessness, are by no means uncommon consequences of loss of blood. In some cases I have seen febrile excitement, of several hours' duration, brought on by blood-letting. (For further details respecting the effects of loss of blood, see Dr. Clutterbuck, *On the proper Administ. of Blood-letting*, 1840).

Dr. Marshall Hall (*On the Morb. and Curative Effects of Loss of Blood*, 1830) has directed attention to the disorder of the cerebral functions (marked by convulsions, delirium, or coma) caused by blood-letting. I may observe, that convulsive movements are by no means uncommon in syncope from general blood-letting, and I think are not always to be considered as denoting that the remedy has been used beyond the safe degree. I have on several occasions been told by patients about to lose blood, that they are apt to faint and struggle when bled; and I have, in consequence, been requested to prevent them from injuring themselves. Delirium and coma are less frequently met with. Great depression of the vascular system, followed by sudden dissolution, is another occasional effect of loss of blood, (see an illustrative case in the *Lancet*, vol. xi. p. 94).

As might be expected, an operation so powerfully affecting the vital functions cannot be passive in its influence over morbid action; but the phenomena vary so much in different diseases, and even in the same disease under different circumstances, that it becomes extremely difficult to offer any general results. That loss of blood is sometimes beneficial, at other times hurtful, is well known. Its immediate beneficial effects are best seen in pneumonia and ophthalmia. In the first of these diseases the respiration sometimes becomes easier, and the pain removed, while the blood is flowing; and from this time the amendment progresses. In ophthalmia, the redness of the conjunctiva disappears during the syncope from blood-letting, and sometimes never returns with equal intensity. A tendency to hemorrhage has been thought by some experienced practitioners to be engendered or increased by the application of leeches. Thus the return of the menses, the aggravation of menorrhagia, hæmoptysis, and apoplexy, have been found to follow, and apparently to result from, the employment of leeches, (see the observations of Laennec and Sir James Clarke, in Forbes's translation of Laennec's *Treat. on Dis. of the Chest*, p. 193, 1827).

The effects of blood-letting are considerably influenced by disease. Every practitioner is acquainted with the fact, that in certain morbid conditions patients bear the loss of larger quantities of blood than in others. I need only mention apoplexy, inflammation of the serous membranes, peripneumony, and phrenitis, as examples of increased tolerance; while chlorosis and cholera may be cited as instances of diminished tolerance. On this point there cannot be, I think, two opinions.

I confess I am not prepared to assent to the inferences Dr. Hall has drawn from these facts, nor to the rules he has laid down in the diagnosis and treatment of disease founded on the circumstances just mentioned. The susceptibility to syncope is so great in some persons, that we should, I suspect, be often led into error, if we were to infer the absence of inflammation merely from the occurrence of fainting after the loss of a few ounces of blood. Besides, it not unfrequently happens, that a patient faints on the first, but not on the second or third bleeding. I have more than once seen this. Neither do I think it would always be safe to bleed *ad deliquium*, even if we were satisfied that inflammation be present; for in some it is difficult to occasion syncope, although the quantity of blood lost be so great as to endanger the safety of the patient. The practice of Dr. Hall, however, is much to be preferred in this respect to that of Mr. Wardrop (*On Blood-letting*); for, although both recommend bleeding to syncope in inflammation, the former places his patient in the erect, the latter in the recumbent posture. And here I cannot help remarking, that the practice of ordering patients to be bled to syncope in the recumbent posture appears to me a highly dangerous one. That fainting will sometimes occur in the erect position, before a sufficient quantity of blood has been drawn, we all know; and, to prevent this occurrence, it is frequently proper to bleed in the recumbent posture: but I must protest against bleeding patients to *syncope* in this position.

I have yet to notice another class of the general effects of the loss of blood, which may be denominated secondary or remote, and which are in no way useful in the treatment of disease. In some cases excessive re-action occurs, attended with throbbing of the vessels of the brain, pain and disorder of the cerebral functions. Examples of this are seen in women who have suffered severely from uterine hemorrhage. Exhaustion, with insufficient re-action, is another remote effect of loss of blood. In two cases of infants, I have seen this effect consequent on hemorrhage after a leech bite, terminate fatally. Other secondary or remote effects of blood-letting are mentioned: they consist principally in disorder of the sensorial functions, marked by delirium, coma, or even amaurosis (Dr. M. Hall, *op. supra cit.*).

Having hitherto described the consequences of bleeding generally, I must now refer more particularly to leeching. The constitutional or general effects caused by the application of leeches are best observed in children and delicate females—more especially the former. I have, on several occasions, seen infants completely blanched by the application of one or two leeches. Pelletan mentions the case of a child, six years old, who died from the hemorrhage occasioned by six leeches applied to the chest. Leeching, then, is here, to all intents and purposes, a mode of general blood-letting, arising in part from the powerful influence which a small quantity of blood produces in infants; and secondly, because one leech will cause the loss of more blood in them than in adults, owing to the greater vascularity of the cutaneous system. It is apparent, therefore, that in the diseases of infants, leeching may, in most cases, be substituted for venesection. But in disorders which are rapidly fatal, as croup, opening the jugular vein is undoubtedly to be preferred, since it is necessary to produce an immediate and powerful effect. As children advance in years they become capable of bearing larger evacuations of blood; and, therefore, leeching excites a less influential effect. It is quite impossible to say at what age venesection ought to be substituted, or, in infancy, what number of leeches should be applied; since they take away such unequal quantities of blood. These are points that must be decided by the practitioner in each case. Here is a tabular statement of the amount of blood which Dr. James Blundell (*Lancet*, Sept. 20, 1828, p. 773) has taken from children at different ages:—

Ages.	Quantities.
2 months	1 oz. to $1\frac{1}{3}$ oz.
4 months	$1\frac{1}{2}$ oz. to 2 oz.
8 months	2 oz. to 3 oz.
12 months	3 oz. to 4 oz.
18 months	4 oz. to 5 oz.
3 years	8 oz. to 10 oz.
6 years	10 oz. to 12 oz.

But the quantities are exceedingly large, and in most instances greater than you will find it prudent to abstract. Guersent says, that in infants up to two years of age, we ought never to draw more than three or four ounces of blood in twenty-four hours. (On the sensible effects of leeches on man, see Vitet, *Traité de la Sangs. Méd.* 1809).

2. *The local effects of leeching* must now be noticed. The jaws of the

leech may be compared to three saws, each armed with sixty teeth. It is, therefore, not surprising that pain and afflux of blood to the wounded part should be occasioned by the laceration of the skin by a single leech. I have sometmes seen one of these animals produce intense redness to the extent of an inch around the bite. This is best observed when the skin is delicate, as that covering the mammæ of the female. Now when a number of these animals are applied, their united local effects must have some influence over a neighbouring disease. There are also certain topical effects which occur subsequently, such as ecchymosis; the irritation and inflammation of the mouths of the punctures; the diffused redness and the soreness in the parts intervening between the bites, which cannot be without influence over morbid action. They act on the principle of counter-irritation. In taking into consideration the beneficial influence of leeches, we must, therefore, not forget these, nor the fomentations and poultices subsequently employed.

When leeches are applied to the temples, especially if they fix close to the external canthus, a diffused swelling frequently arises, similar to that caused by erysipelas. This is not referrible to any noxious qualities of the animal, for it happens when the finest and most healthy are employed; nor to the teeth of the animal being left within the wound, since I have frequently seen it when the leech has fallen off spontaneously.

In concluding these remarks on the local effects of leeches, I have only to add, that independently of the local irritation caused by the puncture, I believe the evacuation of blood from an inflamed part may be more beneficial than the same quantity taken by the usual operation of venesection. In other words, I am disposed to admit what were formerly termed the *derivative* effects of local bleeding. The amount of benefit obtained by the application of leeches to parts that have been injured by falls, &c. as in fractures and dislocations, has frequently appeared to me much greater than could be referred to the combined influence of the quantum of blood lost, and the local irritation of the punctures; so, also, with respect to the good effects of leeching hemorrhoidal tumors. Mr. Wardrop thinks more benefit is in some cases obtained by the application of leeches at a distance from the affected organ, constituting what has been termed a *revulsive* operation.

I trust the remarks now offered will be sufficient to prove, that in estimating the therapeutic influence of leeches, the quantity of blood drawn is not the only element in the calculation; and I think, in practice, constant proof will be found that leeching is more beneficial than can be accounted for by the mere quantity of blood drawn.

USES.—The following are some of the uses of leeches:—

1. *In Children and delicate Adults* (*as females and aged persons*) *leeches often form an excellent substitute for general blood-letting*, where the object is not to occasion any immediate or sudden effect on the disease. In children it is necessary to avoid applying them to the neck, or other parts where compression cannot be conveniently made.

2. *In local determinations of blood*, unattended with febrile symptoms, local blood-letting, when it can be resorted to, is generally, though not invariably, preferred to phlebotomy. The advantages of leeching over cupping are, the less pain, and the ease with which blood may be procured; for it is evident that in swelled testicle, in inflammation attending fractured limbs, and in acute inflammation of the mammary gland,

patients could not, in most cases, bear the necessary pressure of the cupping-glass; and in some parts of the body, as the abdomen, blood can only be procured from cupping by a very dexterous manipulation.

3. In internal and other inflammatory affections, accompanied with constitutional disorder, the rule is to employ general in preference to local blood-letting. But circumstances occasionally render the reverse practice justifiable and proper, as where the disease is not active, and the patient delicate and weak. In many instances you will find it most advantageous to combine both modes of drawing blood: for example, *in abdominal inflammations*, the application of leeches, preceded by venesection, will sometimes do more good than the same quantity taken by the lancet alone. During the progress of *fever* with determination to the brain, the application of leeches to the temples, after the use of blood-letting, is often attended with the best effects.

4. There are some diseases in which no substitute of equal efficacy can be found for leeches. Such, I conceive, are *hemorrhoidal tumors*, and *prolapsus of the rectum*. In these cases general is not equal to local blood-letting, and cupping is out of the question.

5. *In various organic diseases* leeches will often be found an exceedingly useful palliative means. I would particularly mention as examples, affections of the heart and lungs.

There are few diseases in which loss of blood is required, where leeching is positively objectionable; indeed, erysipelas is the only one that can be named. Here it has been supposed that the local irritation caused by leeches would add to the severity of the malady; but I believe that even in this case the objections are more imaginary than real. There are, however, numerous instances in which leeching is negatively objectionable: in some the quantity of blood drawn by these animals is insufficient to make much impression on the disease, as in visceral inflammation of robust persons; in others, where the disease is very rapid and fatal, the effects of leeches are too slow, as in croup. Venesection is the remedy in all those instances. (For a more extended account of the uses of leeching, see Dr. R. Price, *Treat. on the Utility of Sanguisuction*, 1822).

Mode of Applying Leeches.—Let the part be well cleansed (sometimes it may be necessary to shave it): then dry the leeches, by rolling them in a clean linen cloth: place them in the lid of a pill-box, and apply to the affected part. This is a preferable method to applying them by the fingers, or in a wine glass. A narrow tube (called a *leech glass*) will be found useful when we wish to affix one of these animals to the inside of the mouth, or any particular spot.

Several circumstances influence the fixing of leeches; as the condition of the animal, whether healthy or otherwise; the nature and condition of the part to which it is applied; thus, leeches will not readily attach themselves to the soles of the feet, or the palms of the hands, or to the hairy parts—the presence of grease, vinegar, salt, and some other substances, will prevent them from biting; whereas milk, sugared-water, and blood, are said to have the contrary effect. Scarifying the part has been advised to promote their attachment. The condition of the patient also affects the fixing of the animal. Derheims (*Hist. Nat. et Méd. des Sangs.* p. 134. 1825), says that leeches will not bite those under the influence of sulphur, on account of the evolution of sulphuretted hydrogen by the skin. The effluvia, or vapours of the room, as the fumes of tobacco, sulphur, vinegar, &c., will prevent them biting, or even cause them suddenly to fall off.

The quantity of blood a leech is capable of drawing varies considerably. I believe four drachms to be the maximum. On an average I do not think we ought to estimate it at more than one drachm and a half. Of course this has no reference to that lost after the animal has fallen off, and which varies according to the vascularity of the part; in children being oftentimes very considerable. When the leech has had sufficient it drops off; but it is said that if the tail be snipped, the animal will continue to bite, the blood passing out posteriorly as fast as it is taken in by the mouth. I have tried several, but they usually let go their hold the instant the tail is cut. H. Cloquet (*Dict. de Médec.* art. *Sangsue*, p. 83) has made the same remark.

In order to disgorge the leech of the blood, the usual practice is to apply salt to its body; but it is objectionable (if you wish to preserve the animal), since the surface is frequently thereby blistered, and several days elapse ere the creature regains its former activity. Some advise squeezing the blood out by the mouth; others the application of diluted vinegar to the head. If no kind of emetic be employed, the blood remains for a considerable time in the stomach of the leech undigested, but without putrefying.

After-Treatment.—When leeches have fallen off it is generally desirable to promote the sanguineous discharge. This is best done by the use of warm fomentations or cataplasms; or even, in some cases, by cupping-glasses. Great caution is necessary in the case of children. Some years since, the application of a leech was ordered to the chest of a child labouring under pneumonia; it was at the same time mentioned that the bleeding should be encouraged. The directions were literally fulfilled—the discharge of blood was assiduously promoted—until so large a quantity had been lost, that death was the result. No attempt was made to stop it, nor notice sent to the Dispensary, in the practice of which the case occurred. The child being illegitimate, and the mother evidently careless of its recovery, led some to suspect that this did not take place through mere ignorance. In another instance, two leeches were ordered for a child aged about eighteen months, suffering with pneumonic inflammation, a consequence of measles. The following day the poor little creature was found in a fainting, or rather dying state, with face and lips completely blanched. On inquiry it appeared the leech-bites were still bleeding, and no attempt had been made to stop the discharge, the mother thinking it would be beneficial, more especially as the pneumonic symptoms had considerably abated. As predicted, the little sufferer died within twenty-four hours.

In some persons there appears to be an hereditary predisposition to hemorrhage, so that very slight wounds are attended with serious and even fatal effects. Mr. Wilson, quoted by Mr. Wardrop (*op. supra cit.* p. 13), has related the case of a child where one leech had nearly caused death, by the serious hemorrhage. When about three or four years old, this child bit its tongue, and notwithstanding that every attempt was made to stop the discharge, death took place from loss of blood.

I have been called to many cases of hemorrhage after leech-bites, and never failed in stopping it by compression. Sometimes mere exposure to the air will be sufficient; or, if this fail, we may apply a dossil of lint and a bandage. In other instances this will not succeed. I usually employ compression, thus: roll a piece of lint into a fine cone, and introduce it into the bites by means of a needle or probe; over this lay a compress and bandage. Sponge may be substituted for the lint. Various other modes have been proposed; some, I think, exceedingly cruel, since I do not believe them ever necessary. I allude, now, to the application of a red-hot needle; and to passing a needle through the orifice, and wrapping thread round, just as a farrier stops the discharge of blood from the vein of a horse. Some employ absorbing powders, as gum-arabic; or styptic washes, as a saturated solution of alum. One very effectual means is to apply a stick of lunar caustic scraped to a point, or the nitrate of silver. Sir C. Bell, in one case, stitched up the wound.

Accidents from Leeches in the Mucous Cavities.—The ancients were very apprehensive of the ill consequences likely to arise from swallowing leeches. That their fears were not groundless is proved from the following circumstance, related by the celebrated Baron Larrey. When the French army entered upon the deserts which separate Egypt from Syria, the soldiers, pressed by thirst, threw themselves on their faces, and drank greedily of the muddy water, and which, unknown to them, contained leeches (*Sanguisuga ægyptiaca*), having the form of a horse-hair, and the length of a few lines only. Many of them felt immediately stings, or prickling pains, in the posterior fauces, followed by frequent cough, glairy spots, lightly tinged with blood, and a disposition to vomit, with a difficulty of swallowing, laborious respiration, and sharp pains in the chest, loss of appetite and rest, attended with great uneasiness and agitation. On pressing down the tongue of the individual first attacked, a leech was discovered, which was with difficulty removed by the forceps. Little or no hemorrhage followed, and the patient recovered. Those which had attached themselves to the posterior fauces were removed by the use of gargles composed of vinegar and salt water. The Chief of Brigade, Latour-Mauberg, commander of the 22d regiment of chasseurs, swallowed two in the deserts of St. Makaire, a day's journey from the Pyramids, which so much weakened him, that his convalescence was long and difficult.

Derheims (*op. supra cit.* p. 140) relates a case where a young man who had leeches applied to his anus, was so unfortunate as to have one enter his rectum unnoticed. The animal made several punctures; and was not expelled until some hours after, when salt water injections were used. The wounds caused by the bites, however, did not heal for several months, during which time the patient suffered considerably, and constantly passed blood with the fæces.

Whenever practicable, salt-water injections should be resorted to. In the following case, related by Derheims (p. 140) this practice could not be adopted. Two small leeches were applied to the gums of an infant during the period of dentition, and by the inattention of the nurse they fixed themselves at the back part of the mouth, and becoming gorged with blood, caused great difficulty of respiration. The infant, by strongly closing the jaws, prevented the removal of the animals, who only ceased their hold when they were filled with blood. The hemorrhage continued for two hours.

Ill effects have resulted from swallowing leeches. A lady accidentally swallowed a leech she was applying to her gums. Acute cardialgia soon came on, with a feeling of erosion, and creeping in the interior of the stomach; sometimes convulsive movements in the limbs and muscles of the face; frequency and irregularity of the pulse; universal agitation and paleness of the countenance. The physician who was called in, recollecting the fact ascertained by Bibiéna, that leeches could not live on wine, administered half a glass every quarter of an hour. The symptoms were soon alleviated; and the fourth dose caused vomiting, by which the dead leech was evacuated, with much glairy matter, mixed with clots of black blood. By a proper subsequent treatment the patient recovered in eight days (*Recueil Périodique*).

Class 6. Insecta, *Goldfuss*.—Insects.

Articulated animals with six *feet* (*hexopoda*), one pair of *antennæ*, *a dorsal vessel* for circulation, respiring by *tracheæ*, and undergoing *metamorphosis* (being successively *ovum*, *larva*, *pupa*, and *imago*). *Head* distinct from the thorax.

Order 1. Coleoptera, *Linnæus*.—Beetles.

Four *wings*, of which the two upper or anterior (*elytra* or *wing cases*) are horny or leathery, united down the back by a straight suture; lower or posterior wings folded longitudinally. *Mandibles* and *jaws* for mastication.

Canth'aris vesicato'ria, Latreille, L. E. D.—*The Blister Beetle* or *Spanish Fly*.

Lytta vesicatoria, *Fabricius*.—Meloë vesicatorius, *Linnæus*.

(The whole fly, *E*.)

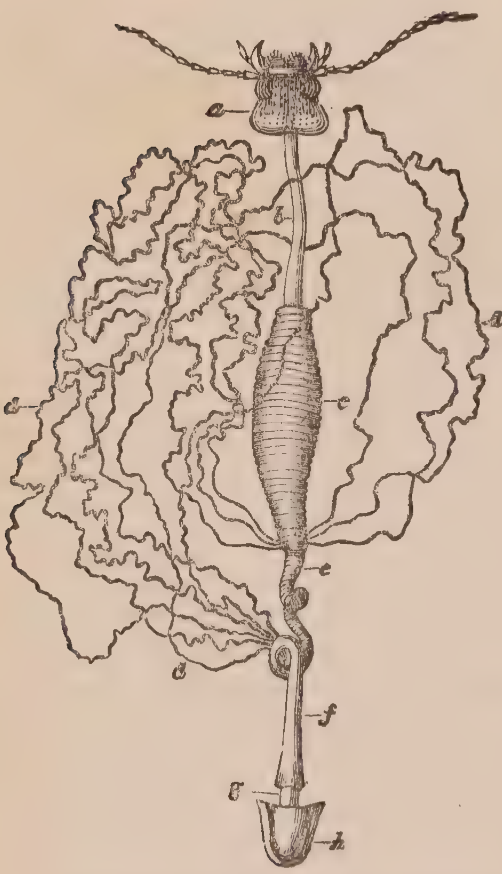
History.—Hippocrates employed in medicine an insect which he calls (κανθαρὶς), whose effects were similar to those of our *Cantharis vesicatoria*. Hence it has been erroneously inferred by some writers that our blistering beetle is identical with that employed by the ancients. That this inference is incorrect is proved by the following facts. In the first place, many beetles agree in their effects on the system with those of Cantharis vesicatoria; secondly, the word κανθαρὶς merely signifies *a small beetle* or *scarabæus parvus*; thirdly, both Dioscorides (lib. ii. cap. 65) and Pliny (*Hist. Nat.* lib. xxix. cap. 30, ed. Valp.) refer to several kinds of *cantharides*, but remark that the most powerful are those with transverse yellow bands on the wings, and that those which are homogeneous in colour are weak and inert. It is tolerably clear, therefore, that neither of these ancient writers were acquainted with Cantharis vesicatoria. Now the characters assigned to the ancient blistering insect agree precisely with those of two species of *Mylabris*. Burmeister (*Man. of Entomol.* by Shuckard, p. 562, 1836) suggests that *Mylabris Füsselini*, a native of the South of Europe, was the species used by the ancients. *Mylabris Cichorii* is employed as a blistering beetle at the present day in China and some parts of Hindostan, and may, perhaps, have been used by the Greeks and Romans.

Zoology. Gen. Char.—*Antennæ* elongate, simple, filiform. *Maxillary palpi* with terminal joint somewhat ovate. *Head* large, heart-shaped. *Thorax* small, rather quadrate, narrower than the elytra, which are as long as the abdomen, soft, linear, the apex slightly gaping. *Wings* two, ample (J. F. Stephens, *Man. of Brit. Coleopt.* p. 334, 1839).

Sp. Char.—Bright glossy brass-green or bluish, glabrous; beneath more glossy, with a few hairs. *Breast* densely pubescent, finely punctured. *Head* and *thorax* with a longitudinal channel. *Elytra* with two slightly raised lines. *Tarsi* violaceous. *Antennæ* black, with the basal joint brassy (J. F. Stephens).

Form elongated, almost cylindrical. *Length* six to eleven lines. *Breadth* one to two lines. *Colour* brass or copper green. *Odour* nauseous, unpleasant. *Body* covered with whitish grey hairs, which are most numerous on the thorax. *Head* large, subcordate, with a longitudinal furrow along its top. *Eyes* lateral, dark brown. *Thorax* not larger than the head, narrowed at the base. *Elytra* from four to six lines long, and from 3-4ths to 1½ lines broad; costa slightly margined. *Wings* ample, thin, membraneous, veined, transparent, pale brown; tips folded. *Legs* stout, from four to six lines long, the hinder ones longest: *tibiæ* clavate, in the female all terminated by two small moveable *spurs;* in the male the two hinder pairs of extremities alone have this arrangement, the anterior ones having but one spur; last joint of the *tarsi* with a pair of bifid claws. *Abdomen* soft, broadest in the female. In the female, near the anus, are two articulated, caudal appendages.

Fig. 246.

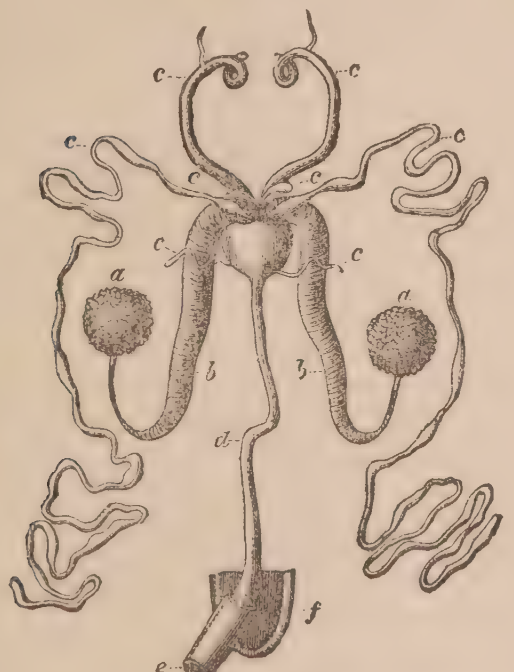


Digestive Organs of the Cantharis vesicatoria.

a. The head, which supports the antennæ, the eyes, a transverse clypeus, to which is united anteriorly the labrum: on the sides of the latter are the mandibles and maxillary palpi.
b. The œsophagus.
c. The stomach.
d d d. The biliary vessels.
e. The intestine.
f. The cæcum.
g. The rectum.
h. The last ring of the abdomen.

The *internal organization* of these animals has been elaborately studied by Audouin (*Ann. des Scienc. Nat.* t. ix. p. 31). and by Brandt (*Med. Zool.* ii). The Nervous System consists of a cerebro-spinal axis, and of a double and single sympathetic system. The *cerebro-spinal axis* consists of a double nervous cord, and nine ganglia (two cephalic, one of which is the brain, three thoracic, and four abdominal). The *single sympathetic system* commences at the brain by two branches, which unite at the ganglium frontale, from which a single nerve proceeds along the œsophagus to the stomach, where it divides into two, forming at its division a small ganglion. The *double sympathetic system* consists of four ganglia placed on the œsophagus, two on either side of the single nervous cord just described, with which, as well as with the brain, they are connected by nervous twigs. The Vascular System consists of *a simple pulsating dorsal vessel*, which extends from the head to the extremity of the abdomen. The Respiratory System consists of ten pair (three thoracic, seven abdominal) of stigmata, which open into the tracheæ. The Digestive System consists of the *mouth*, which terminates in the *pharynx*. The latter contracts into a long muscular *œsophagus,* which ends in an elongated fusiform *stomach.* The latter is marked transversely by bands formed by the mu scular coat Between the stomach and intestine is a *valve* (pylorus) formed by four small, floating, kidney-shaped bodies. The *small intestine* forms two curvatures, and then proceeding directly backwards terminates in the swollen *cæcum*, which ends in the very short, narrow *rectum.* The *biliary vessels* consist of six very long, filiform, convoluted tubes, which terminate anteriorly at the stomach near the pylorus, and posteriorly at the intestine near the cæcum. THE SEXUAL SYSTEM of the MALE consists of a pair of spherical *testicles*, having externally a granulated appearance; two *vasa deferentia*, which have a ringed appearance; three or four pair of tubes (*seminal vesicles* or *epididymoid vessels*), the functions of which are imperfectly known; a *common spermatic duct;* and a *penis* which has three barbs or *hooks* at its extremity, and is enveloped by a *sheath.* THE FEMALE ORGANS consist of two large, hollow, egg-shaped *ovaries*, the cavities of which are called *calyces.* On their external surface is an immense number of pyriform *egg tubes.* From each ovary or calyx arise an *oviduct*, and the two oviducts by their junction form the *common oviduct*, the lower portion of which is called the *vagina.* Into the common oviduct passes a *tube* from a vesicular bag, called *spermatheca* (*vesicule copulatrice*, Audouin), and also of other *appendages* (*sebaceous glands*, Audouin).

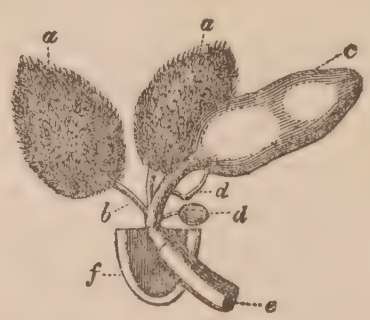
FIG. 247.



Male Genital Organs of Cantharis vesicatoria.

a a, Testicles.
b b, Vasa deferentia.
c c, *c c*, *c c*, *c*, *c*, The four pair of vesiculæ seminales, or epididymoid vessels.
d, The common spermatic tube.
e, Portion of the intestinal tube inverted.
f, Last abdominal ring.

FIG. 248.



Female Organs of Cantharis vesicatoria.

a a, The ovaries covered by the egg tubes. Each ovary sends out an oviduct, *b*. The two ducts unite to form the common oviduct, which receives the excretory tube of the *spermatheca*, *c*, and of other appendages, *d d*.
e, Portion of the inverted intestine.
f, Last abdominal ring.

I must refer to Audouin's paper for an amusing account of the amours of these animals.

HAB.—Europe. Originally, perhaps, a native of the southern parts, especially Italy and Spain. Now found in France, Germany, Hungary, Russia, and England. With us they are rare. In the summer of 1837 they were abundant in Essex and Suffolk (Westwood, *Intr. to the Mod. Classif. of Insects*, vol. i. 1839). They are found on species of *Oleaceæ* (as the ash, privot, and lilac), and of *Caprifoliaceæ* (as the elder and Lonicera).

Mode of catching Cantharides.—In the south of France these animals are caught during the month of May, either in the morning or evening, when they are less active, by spreading large cloths under the trees, which are then strongly shaken, or beaten with long poles. The catchers usually cover their faces, and guard their hands by gloves, (Richard, *Dict. des. Drog.* i. 550). Various methods have been recommended for killing the insects; such as exposing them to the vapour of vinegar (the practice mentioned by Dioscorides), or of hot water, or of spirit of wine, or of the oil of turpentine. Geiger states, that if destroyed by dropping oil of turpentine into the bottle in which they are contained, they are not subject to the attack of mites; but I believe they are more frequently destroyed by immersing the cloths containing them in hot vinegar and water, and then drying on hurdles covered with paper or cloths.

Preservation.—Cantharides should be preserved in well-stoppered glass bottles, and to prevent them from being attacked by mites (*Acarus domesticus*), a few drops of strong acetic acid should be added to them. I have found this a most successful mode of preservation. Besides mites, they are subject to the attacks of a moth (*Tinea flavifrontella)* and two coleopterous insects (*Anthrenus muscorum* and *Hoplia farinosa.*)

Commerce.—Cantharides are imported from St. Petersburgh, in cases, each containing 160 or 170 lbs.; and also from Messina, in barrels or cases, holding each about 100 lbs. They are principally brought over towards the end of the year.

In 1839, duty (1s. per lb.) was paid on 16,376 lbs.

The cantharides from St. Petersburgh are the largest and most esteemed. They are somewhat more copper-coloured than the French or English varieties, which have rather a brassy than copper tint.

Characteristics for Medico-legal purposes.—There are no *chemical tests* for cantharides to be relied on. Orfila (*Toxicol. Gén.*) has published the effects of various reagents on tincture of cantharides; but they are unimportant. Cantharides are rarely met with in a sufficiently perfect form to enable us to recognise them by their *zoological characters.* Their *physical characters* are much more important. In all powders of cantharides you may distinguish golden-green particles; these may be separated from the other contents of the stomach by immersing them in boiling water: the fatty matter rises to the surface, while the cantharides powder falls to the bottom. Orfila has recognised these particles in a body nine months after interment; so that they do not readily decompose, even when mixed with decaying animal matters. Some other insects, however, have the same golden-green colour, but are without vesicating properties; and *vice versâ,* there are many insects which vesicate, but which have not a golden-green colour. The physical characters of the particles, aided by their *physiological effects,* together form tolerably conclusive evidence of the presence of cantharides. To judge of the effects of cantharides, and their preparations, we should proceed as follows:—If the suspected matter be a liquid, evaporate it to the consistence of an extract; then digest in repeated quantities of sulphuric ether. The etherial solutions are to be mixed, and allowed to evaporate in the air: the vesicating properties of the residuum may be determined by applying it to the inside of the lip or to the arm. If the suspected matter contain solid particles, these are to be digested in ether, and the concentrated tincture applied to the inner surface of the lip (see *Ann. d'Hygiène Publique*, 1835, xiii. p. 455). Dr. Hastings (*Trans. of the Provinc. Med. and Surg. Assoc.* vol. i. p. 402.) has published an interesting fatal case of inflammation of the alimentary canal and urinary organs. The symptoms simulated those caused by excessive doses of cantharides; but the moral and other evidence seemed to negative the suspicion that these insects had been taken.

ADULTERATION AND GOODNESS.—The goodness or quality of cantharides may be recognised by their odour, and freedom from other insects, especially mites. Sometimes the powder, but more commonly the plaster, is adulterated with powdered euphorbium. I have been informed, by persons well acquainted with the fact, that it is a common practice, amongst certain druggists, to mix one pound of euphorbium with fourteen pounds of powdered Spanish flies.

COMPOSITION.—Cantharides were analyzed, in 1803, by Thouvenal (*Ann. de Chim.* xlvii. 230), in 1804, by Beaupoil (*Ibid.* xlviii. 29), and in 1810, by Robiquet (*Ibid.* lxxvi. 302).

Thouvenal's Analysis.

Watery extract	37·50
Subsequent alcoholic extract	10·42
Subsequent etherial extract	2·08
Insoluble residuum	50·00
Total	100·00

Beaupoil's Analysis.

Black matter insoluble in alcohol, but soluble in water	12·94
Yellow matter soluble in water, alcohol, and ether	12·94
Green oil soluble in alcohol and ether	13·99
Parenchyma, salts, & oxide of iron	60·13
Phosphoric acid	?
Total	100·00

Robiquet's Analysis.

1. *Cantharidin.*
2. Green fixed oil, soluble in alcohol.
3. Fatty matter, insoluble in alcohol.
4. Yellow viscid substance, soluble in water and alcohol (osmazome?)
5. Black matter, soluble in water, insoluble in alcohol
6. Yellow matter, soluble in ether and alcohol.
7. Free acetic and uric acids.
8. Phosphate of lime, and phosphate of magnesia.

Cantharis vesicatoria.

1. *Cantharidin* (*Vesicatorin; Cantharides-Camphor*).—Has been found in *Cantharides vesicatoria*, *Lytta vittata*, *Mylabris Cichorii*, and other vesicating insects. Probably exists in all the blistering beetles. To procure it, concentrate an alcoholic tincture (prepared by percolation) and set aside: the cantharidin slowly crystallizes. It is purified by washing with cold alcohol, and boiling with alcohol and animal charcoal. Its properties are as follows:—It crystallizes in the form of micaceous plates, which are fusible, forming a yellow oil, which by a stronger heat is vaporizable, forming white vapours: these subsequently condense into acicular crystals of cantharidin. Dana regards it as an organic alkali, but without any just grounds; for it will not restore the blue colour of litmus paper reddened by an acid. Gmelin's opinion, that it is a solid volatile oil, seems to be correct. When isolated, it is not soluble in water, but becomes so by combination with the other constituents of cantharides; the yellow matter probably being the principal agent in rendering it so. This, then, is the reason why an aqueous infusion of the insects contains cantharidin in solution. Cold spirit, digested on cantharides, extracts cantharidin; which it can only do by the agency of some of the other principles of the flies. It is easily soluble in ether, oils (volatile and fixed), and hot spirit of wine; and from the latter it separates as the liquid cools. Concentrated boiling sulphuric acid dissolves cantharidin: the solution is slightly brown; when diluted with water, it deposits small needle-like crystals of cantharidin. Boiling nitric and muriatic acids dissolve it without changing colour; the solutions, by cooling, deposit it. Cantharidin is dissolved by

potash and soda; but when concentrated acetic acid is added to the solution, the cantharidin is precipitated. Ammonia is without action on it. According to Regnaud it consists of *carbon*, 61·68; *hydrogen*, 6·04; and *oxygen*, 32·28.

2. *Volatile Odorous Oil?*—Orfila asserts, that volatile odorous oil is one of the constituents of the insects. The distilled water of cantharides is strongly odorous and milky; and its vapour affects the eyes and kidneys like cantharides.

The active and odorous principles of cantharides reside principally in the sexual organs of the animals. Both Farines and Zier tell us, that the soft contain more active matter than the hard parts. It appears, also, that the posterior is much more acrid than the anterior portion of the body; and Zier says the ovaries are particularly rich in this active matter. If so, it is evident we ought to prefer large female to male insects. It is a well-known fact, that the odour of these animals becomes much more powerful at the season of copulation than at other periods; and that persons sitting under the trees, in which these insects are, at this season more particularly, are very apt to be attacked with ophthalmia and ardor urinæ.

Robiquet thus describes the effects of cantharidin:—The 1-100th part of a grain, placed on a slip of paper and applied to the edge of the lower lip, caused, in about a quarter of an hour, small blisters. A little cerate being applied, served only to extend the action over a larger surface, and both lips were in consequence covered with blisters. Some atoms of cantharidin, dissolved in two or three drops of almond oil, were rubbed over a small piece of paper and applied to the arm; in six hours a blister was formed, the size of the paper. The volatility of cantharidin at a comparatively low temperature, and the action of the vapour on the conjunctival membrane, are shown by the accident which happened to one of Robiquet's pupils, who was watching its crystallization, and felt acute pain in the conjunctiva, which was followed by inflammation, accompanied with small phlyctenæ and loss of sight for several days. Robiquet, who was not so near the liquid, suffered but slightly. I have suffered once in preparing this substance. I applied one drop of an etherial solution of impure cantharidin to the inside of the lower lip; but immediately afterwards, repenting of my temerity, I wiped it carefully off. In about an hour a blister had formed on the inside of the lip, and it was five or six days before the part had completely healed. Bretonneau, in his experiments on animals, has not found any marked aphrodisiac effect produced by cantharidin. He found that it rendered the circulation slower, and caused fatal lethargy.

Physiological Effects. (*a.*) *On Animals.*—The principal experiments with cantharides on animals (dogs) are those of Orfila (*Toxicol. Gén.*) and Schubarth (Wibmer, *Wirk. d. Arzneim. u. Gifte*, Bd. iii. s. 262). It results from their investigations that these insects cause violent inflammation in the parts to which they are applied, and an affection of the nervous system, (spinal cord principally). Injected into the jugular vein, the oleaginous infusion caused tetanus; introduced into the stomach, the œsophagus being tied, the tincture produced insensibility, (Orfila). Inflammation of the inner coat of the bladder was observed when the poison had remained in the stomach for a few hours before death.

(*b.*) *On Man.—The topical effects* of cantharides are those of a most powerful acrid. When these insects are applied to the *skin*, the first effects noticed are, a sensation of heat accompanied by pain, redness, and slight swelling. These phenomena are soon followed by a serous affection between the corium and epidermis, by which the latter is raised, forming what is commonly termed a *blister*, or, in the more precise language of the cutaneous pathologist, an *ampulla* or *bulla*. The effused liquid has a pale yellow colour, with a very feeble taste and smell. Two analyses of it have been made:—

Analysis by Dr. Bostock.

Albumen	6.00
Uncoagulable matter	0·14
Salts	1·00
Water	92·86
	100·00

Analysis by Brandes and Reimann.

Albumen	5·75
Animal matter, with muriate of ammonia, potash salts, carbonate, lactate, muriate and sulphate of soda	0·26
Water	93·99
	100·00

If the cuticle be removed, the subjacent corium is seen intensely reddened, and, by exposure to the air, oftentimes becomes exceedingly painful. If irritants be applied, a secretion of pus takes place, and sometimes a whitish-looking false membrane is formed. Long-continued irritation occasionally causes tubercular granulations. Not unfrequently I have noticed ecthymatous pustules around the blistered surface; and in one remarkable case, which fell under my notice, the whole body, but more especially the pectoral region, (to which the blister had been applied), was covered with them. Sometimes the vesicles of eczema occur. Ulceration and gangrene are not uncommon: the latter effect is occasionally observed after exanthematous diseases, especially measles. I have seen death result therefrom in two instances. The constitutional symptoms frequently produced are excitement of the vascular system (as denoted by the increased frequency of pulse, heat of skin, and furred tongue), and irritation of the urinary and genital organs (marked by heat and pain in passing the urine, which is usually high coloured, or there may be complete suppression). It not unfrequently happens, that the part to which a blister has been applied remains considerably darker coloured than the surrounding skin. Rayer states, that the disappearance of these discolorations is hastened by the use of sulphurous baths.

When swallowed, cantharides act topically on the *gastro-intestinal membrane;* in poisonous quantities exciting inflammation of the mucous lining of the alimentary canal, accompanied with constriction and difficulty of swallowing, which is sometimes so great, that not a particle of fluid can be got into the stomach without the most inexpressible anguish; violent and burning pain, nausea, vomiting, frequently of bloody matters, sometimes with flakes like the inner lining of the alimentary tube, and great tenderness to touch. These phenomena sufficiently indicate the gastric inflammation. Ptyalism is not an uncommon occurrence. The enteritic symptoms are, abundant and frequent evacuations, sometimes of blood, with horrible griping and burning pain, and exquisite sensibility of the abdomen.

The *volatile odorous matter* evolved by these insects is a local irritant; for it causes itching and even inflammation of the eyelids and conjunctiva, irritation of the air-passages, marked by epistaxis, convulsive sneezing, &c. If it be inhaled, as is done when persons sit under trees on which the animals are found, or by breathing the vapour of the decoction of cantharides, an affection of the urinary organs may be brought on. The same remote effects may also be excited by blisters, by handling the insects, by applying them to wounds, by swallowing them, or by injecting solutions of their active principle into the veins. We may classify the *remote effects* of cantharides into those observed in the urino-genital, the nervous, and the vascular systems.

(a.) Action on the urino-genital system.—The pain in the loins, and the alteration in the quantity and quality of the urine, are the symptoms indicative of the inflamed condition of the kidneys. The burning pain and tenderness in the hypogastric region, and the constant desire to pass the urine, with the inability of doing so except drop by drop, are evidences of the vesical inflammation. The action on the genital organs in the male is proved by priapism, which is sometimes accompanied by satyriasis, sometimes not; and by the occasional inflammation and mortification of the external organs. In the female, the action on the sexual system is shewn by the local heat and irritation, and by the occasional occurrence of abortion.

(b.) Action on the nervous system.—The affection of this system is proved by the pain in the head, disordered intellect, manifested in the form of furious or phrenitic delirium, convulsions of the tetanic kind, and subsequently coma. It is deserving of especial notice, that sometimes several days elapse before the nervous symptoms show themselves: thus, in a case related by Giulio, they appeared on the third day; in another instance, mentioned by Graaf, on the eighth; and in a case noticed by Dr. Ives, they were not observed until the fourteenth day (see Christison, *Treat. on Poisons*).

(c.) Action on the vascular system.—The pulse becomes hard and frequent, the skin hot, and the respiration quickened; diaphoresis is occasionally observed.

The susceptibility to the influence of cantharides is by no means uniform. Werlhoff mentions the case of a lad who used to be attacked with priapism and involuntary emission by merely smelling the powder. Amoreux says, in one case a pinch of the powder caused death; while in another a spoonful occasioned only slight heat in the throat and ardor urinæ. Dr. Hosack has mentioned an instance in which a man took nearly six ounces of the tincture with the view of self-destruction, yet no dangerous symptoms followed. In contrast with this, I may instance a case that came within my own knowledge, where one ounce of the tincture produced serious symptoms. Orfila has seen twenty-four grains of the powder prove fatal.

1. *Action in small or medicinal doses.*—In very small quantities there are no obvious effects. If we increase the dose, a sensation of warmth is felt in the throat, stomach, and respiratory passages, with increased secretion from the alimentary tube. By continued use, a tickling or burning sensation is experienced in the urethra, with frequent desire to pass the urine, which may or may not be altered in quality and quantity. In some cases diuresis is observed, in others not: in the latter the urine is generally higher coloured than usual. Occasionally the sexual feelings are excited.

2. *Action in larger doses: Subacute poisoning.*—The symptoms are heat in the throat, stomach, intestines, and respiratory passages; pain in the loins, burning sensation in the bladder, with frequent desire to evacuate the urine, which is sometimes bloody, and passed with difficulty. Painful priapism, with or without satyriasis. Pulse more frequent, skin hot, and the respiration quickened: the nervous system is frequently excited.

3. *Action in still larger doses: Acute poisoning.*—The symptoms ob

served are, in part, common to other irritant poisons; in part peculiar to the vesicating insects. Violent burning pain in the stomach, with exquisite sensibility and constant vomiting; extreme thirst, dryness, and fœtid odour of the mouth, and not unfrequently ptyalism. Burning pain and spasmodic contraction of the bladder, giving rise to the most excruciating agony. Notwithstanding the incessant desire to void urine, nothing but drops of blood are passed, and with great pain. The constriction of the throat and difficulty of deglutition are most distressing and alarming: the unfortunate sufferer is constantly tormented with violent gripings, purging, generally of blood, extreme tenderness of the whole abdominal surface, faintings, giddiness, convulsions, and an almost hydrophobic aversion to liquids, with delirium terminating in coma.

The mode, and the immediate cause of death, are various: sometimes the nervous symptoms kill before gangrene makes its appearance; but more usually the patient dies from the inflammation and subsequent mortification of the alimentary tube or of the genital organs.

Post-mortem Appearances.—On opening the bodies of persons poisoned by cantharides, inflammation and its consequences have been observed in the alimentary tube, and the urinary and genital organs. The cerebral vessels have been found in a congested state. It is deserving of notice that inflammation of the urino-genital organs is more likely to be met with in patients dying within a few days after poisoning.

Uses.—Hippocrates used vesicating insects (under the name of cantharides) internally; but the practice was subsequently regarded as dangerous; and, so lately as the year 1693, the President of the College of Physicians committed Dr. Greenfield to Newgate for daring to employ them!! (Greenfield, *Treat. on Cantharides*, transl. by Martin, 1706).

1. *Local uses.*—Cantharides are frequently used as topical agents; sometimes as stimulants, sometimes as rubefacients, at other times as vesicants.

(*a.*) *To stimulate topically.*—Tincture of cantharides with water (in the proportion of three or four drachms of the tincture to a pint of water) has been employed *to stimulate ulcers;* more especially sinuses and fistulous sores. It is used on the same principle that stimulant and irritant applications are made to the eye in ophthalmia; that is, to excite a new action, which shall supersede the old one. Matthew's once celebrated injection for fistula in ano is a wash of this kind (Dr. Paris, *Pharmacologia*). In *alopecia* or *baldness*, when this is not the result of old age, unguents of cantharides have been employed to promote the growth of hair. Powdered cantharides have been advised as an application *to the parts bitten by rabid animals.*

(*b.*) *To produce rubefaction.*—For this purpose the tincture may be mixed with soap or camphor liniment; or, when it is desirable to limit the effect to a particular spot, and especially if friction be objectionable, the common blistering plaster may be applied, allowing it to remain in contact with the part for an hour or two only. Rubefacient liniments are employed to *excite the sensibility of the skin in numbness and paralysis;* as also *to promote local irritation in neuralgic and rheumatic pains.* In the *inflammatory affections of children* it will be occasionally found useful to employ the plaster as a rubefacient merely.

(*c.*) *To excite vesication.*—A considerable number of substances (mineral, vegetable, and animal) cause vesication when applied to the skin.

Horse-radish, mezereon, liquor ammoniæ, and acetic acid, may be mentioned as examples. To these may be added heat, applied in the form of hot water or a hot metallic plate. For facility of application, certainty of effect, and slightness of pain, no agents are equal to cantharides, and these are now almost solely used.

It was formerly supposed that the efficacy of blisters was in proportion to the quantity of fluid discharged. But the truth is, that the therapeutic influence is in proportion to the local irritation, and has no more relation to the quantity of fluid discharged, than that the latter is frequently (not invariably) in the ratio of the former. Stoll's axiom is therefore correct: —" Non suppuratio sed stimulus prodest." As to the precise manner in which blisters, or, indeed, any remedies, influence diseases, we are quite in the dark. We are accustomed to refer their operation to the principle of counter-irritation (see p. 45). I must refer those who feel interested in the question, whether blisters ought to be applied in the neighbourhood of, or at a distance from, the affected part, to a paper by Barthez, in the *Recueil de la Société Médicale de Paris*. In this country we generally apply them near to the morbid part; to which practice Barthez assents, with some exceptions.

We employ blisters in inflammatory diseases, both acute and chronic; in the former, however, preceding their use by blood-letting. In chronic inflammatory diseases we often employ what is termed a perpetual blister—that is, the cuticle is removed, and the blistered surface dressed with savine or cantharides ointment. This practice is advisable in chronic diseases of the chest, of the joints, of the eyes, &c. Blisters are sometimes useful in erysipelas; thus to localize the disease when disposed to spread, and as a revulsive, applied to the feet, in erysipelas of the head. A blister to the perineum has been sometimes found beneficial in gleet.

It is hardly safe to apply blisters to children immediately after exanthematous diseases, sloughing being not an unfrequent result. If it be required to produce in them counter-irritation, the best plan is to dilute the common blistering plaster, by mixing it with three times its weight of soap cerate. I have seen this compound frequently employed, but never observed any unpleasant results from it. Another plan, sometimes adopted, is to apply a common blister, for an hour or two only, so that it shall merely produce rubefaction.

2. *Remote uses.*—These will require examination under distinct heads, according to the particular object we have in view in employing cantharides.

(*a.*) *To act specifically on the urinary organs.*—In *dropsy* they have been used to excite diuresis, though they frequently fail in producing this effect.—In *diabetes*, cantharides have been employed, but without apparent benefit.—In *paralysis of the bladder* they are frequently useful when there are no marks of local irritation. Two opposite conditions may be the result of paralysis of this organ; namely, retention or incontinence of urine. The latter condition is not unfrequently met with in children, and is very likely to be relieved by cantharides. It is usually stated that they are particularly serviceable in that species of incontinence which occurs during sleep only; but I have seen them cure the disease during day, and fail in giving relief at night. The case alluded to was that of a boy, 14 years old, who had been subject to incontinence of urine since his infancy. He was a robust lad, and apparently in the most perfect health. I put him under the influence of gradually increased doses of tincture of cantharides, and within two months he was enabled to retain his urine by day, but it still passed involuntarily at night ; and though he continued the remedy for a considerable time, no further benefit was obtained. In incontinence of urine which occurs after lingering labours, from the long-continued pressure of the child's head, cantharides are sometimes serviceable. But their use must not be commenced until all the symptoms of local irritation have subsided.

(*b.*) *To act on the organs of generation.*—In consequence of the specific stimulus communicated by cantharides to the bladder, it has been supposed that the same influence might be extended to the uterus ; and thus these insects have been employed *as stimulating emmenagogues*, in some cases with apparent benefit, but frequently without any obvious effect. Abortion has occasionally happened from their employment, as I have myself witnessed in one case.

Cantharides are also employed as *an aphrodisiac*, both in man and other animals (as horses, heifers, and asses). In man, if given in sufficient quantity to affect the sexual feelings, it endangers the patient's safety. Most of the cases in which we are requested to administer aphrodisiacs, will be found, on examination, to require moral rather than pharmacological treatment. *In discharges from the genital organs*, beneficial effects are frequently obtained by the internal use of cantharides. In gleet it has been often found serviceable. Mr. Roberton (*Pract. Treat. on the Powers of Cantharides*, 1806), explains their efficacy by saying that they excite a mild inflammatory action on the urethra (shewn by the discharge becoming thick, opaque, and puriform), which supersedes the previous morbid one. I have frequently found equal parts of tincture of chloride of iron and tincture of cantharides a successful combination in old standing gonorrhœas. The dose is twenty drops at the commencement.

(*c.*) *In chronic skin diseases.*—Pliny states that cantharides (*Mylabris*) were employed in a disease which he terms lichen. At the present time, tincture of cantharides is not unfrequently employed in *lepra*, *psoriasis*. and *eczema*. Having found other remedies very successful in lepra and psoriasis, I have rarely had occasion to try cantharides ; but Rayer (*Diseases of the Skin*, translated by Dr. R. Willis) says, " Of all the energetic and dangerous remedies that have been used in lepra, the tincture of cantharides is, perhaps, that which has the most remarkable influence over the disease. The great objection to its employment is its liability to excite inflammation in the digestive organs and urinary passages, especially among females, which necessitates the immediate suspension, and occasionally the entire abandonment of the medicine." Biett has found it successful in chronic eczema, as well as in the scaly diseases.

(*d.*) *In diseases of the nervous system*, cantharides were at one time in great repute. The cases in which they were employed were hydrophobia, epilepsy, chorea, tetanus, and mania. Experience has shewn they deserve little attention in any of these complaints.

(*e.*) *In obstinate sores*, Mr. Roberton recommends cantharides on the same principle that he uses them in gleet.

Administration.—*Powdered* cantharides are not frequently employed internally. The dose is one or two grains in the form of pill. The *tincture* is the safest preparation, and should, therefore, always be preferred.

1. *Acetum Cantharidis* (*Epispasticum*), L. *Acetum Cantharidis*, E. (Cantharides, rubbed to powder, ℥iij.; Acetic Acid, Oj. Macerate the Cantharides with the Acid for eight days, occasionally shaking. Lastly, express and strain, *L.*—" Cantharides, in powder, ℥iij.; Acetic Acid, f℥v.; Pyroligneous Acid, f℥xv.; Euphorbium, in coarse powder, ʒss. Mix the acids, add the powders, macerate for seven days, strain and express strongly, and filter the liquors," *E*).—Not fitted for internal employment. Applied to the skin as a convenient and prompt vesicant. In the formula of the London College, eight times as much cantharides are employed as in the tincture.

2. *Tinctura Cantharidis*, L. E. D.—*Tinctura Lyttæ.* (Cantharides, in powder, ʒiv. [ʒij. *D.*]; Proof Spirit, Oij. [Oiij. *E.* Oiss. wine measure, *D*]. Macerate for fourteen [seven, *E. D.*] days, [strain and express strongly the residuum, *E.*] and filter.—" This tincture may be obtained much more conveniently and expeditiously by percolation, provided the cantharides be reduced to coarse powder, and left with a little of the spirit in the state of pulp for twelve hours before the process of percolation is commenced," *E*).—It is to be regretted that the strength of this preparation is not uniform in the three British Pharmacopœias. Dose, ♏x. gradually increased to fʒj. Its effects on the bladder must be carefully watched. It should be given in some demulcent liquid, as barley-water or linseed tea. It is sometimes employed externally as a rubefacient.

3. *Ceratum Cantharidis*, L. *Unguentum Cantharidis*, E. (Cantharidis, in very fine powder, ℥j.; Spermaceti Cerate, [Resinous Ointment, *E.*] ℥vj. [℥vij. *E*]. Add the cantharides to the cerate, softened by heat, and mix). This preparation must not be confounded with the next one, than which it is more irritant. The uses of the two are the same. From the greater activity of the cerate more danger of the absorption of the active principle of the cantharides is to be apprehended. When this occurs the bladder becomes affected, and, in severe cases, inflammation of the absorbents and fever are produced.

4. *Unguentum Infusi Cantharidis*, E. *Unguentum Cantharidis*, L. D.—(Cantharides, in very fine powder, ℥j; Distilled Water, f℥iv; Resinous Cerate, ℥iv. Boil the water with the cantharides down to one half, and strain. Mix the cerate with the strained liquor, then evaporate the mixture to a proper consistence, *L. D.*—" Cantharides, in moderately fine powder, Resin, and Bees' Wax, of each ℥j; Venice Turpentine and Axunge, of each ℥ij; Boiling Water, f℥v. Infuse the cantharidis in the water for one night, squeeze strongly, and filter the expressed liquid. Add the axunge and boil till the water is dispersed. Then add the wax and resin; and when these have become liquid, remove the vessel from the fire, add the Turpentine, and mix the whole thoroughly," *E.*)—A milder and less certain preparation than the preceding. Used to excite a purulent discharge from blistered surfaces, and to stimulate issues and indolent ulcers.

5. *Emplastrum Cantharidis*, L. E. D. *Emplastrum Lyttæ. Blistering Plaster.* (Cantharides, in very fine powder, lb.j.; Plaster of Wax, lb.jss.; Lard, lb.ss. *L.*—Cantharides, in very fine powder; Resin; Bees' Wax, and Suet, of each ʒij. *E.*—Cantharides, in very fine powder; Yellow Wax, of each lb.j.; Yellow Resin, ʒiv.; Mutton Suet; Hog's Lard, of each lb. ss. *D.*—" Liquefy the fats, remove from the

heat, sprinkle in the cantharides in very fine powder, and stir briskly, as the mixture concretes on cooling," *E.*)—Dishonest druggists sometimes omit a portion of the cantharides here ordered, and substitute powdered euphorbium. In making blistering plasters, care must be taken not to add the cantharides while the melted lard is quite hot, as the heat greatly injures the vesicating power of the insect. For a similar reason the plaster should be spread by the thumb, a heated spatula being objectionable. To prevent the blister moving after its application to the skin, its margin should be covered with adhesive plaster. In order to guard against any affection of the urinary organs, place a piece of thin book-muslin or silver (tissue) paper between the plaster and the skin. The efficacy of the blister depends on the fatty matter dissolving the cantharidin and transuding through the muslin or paper. Some recommend the paper to be soaked in oil, which is supposed to dissolve the cantharidin. Now oil, not being miscible with the blood, is not readily absorbed; and hence, it is supposed, arises its protective influence. The usual time requisite for a blistering plaster to remain in contact with the skin is twelve hours; the vesicle is then to be cut at its most depending part, and dressed with a spermaceti ointment. When the irritation caused by these plasters is excessive, it is sometimes necessary to substitute a poultice for the ointment. When we wish to make a perpetual blister, the cerate of cantharides is employed as a dressing; or if we wish to excite less irritation, and prevent the possibility of the urinary organs being affected, the cerate of savine. The danger of applying blisters to children after exanthematous diseases, especially measles, has been already noticed (see pp. 1368 and 1372).

6. *Emplastrum Cantharidis compositum*, E. (Venice Turpentine, ℥ivss.; Burgundy Pitch and Cantharides, of each ℥iij.; Bees' Wax, ℥j.; Verdigris, ℥ss.; White Mustard Seed and Black Pepper, of each ʒij. Liquefy the wax and Burgundy pitch, add the turpentine, and, while the mixture is hot, sprinkle into it the remaining articles previously in fine powder, and mixed together. Stir the whole briskly, as it concretes in cooling, *E.*)—" This is supposed to be a most infallible blistering plaster. It certainly contains a sufficient variety of stimulating ingredients" (Duncan, *Edinb. Dispens.*)

Antidote.—In poisoning by cantharides, remove the poison as speedily as possible from the stomach. If sickness have not commenced, this may be effected by the stomach-pump, emetics, or tickling the throat (see treatment of poisoning by Opium, p. 1319). Assist the vomiting by mucilaginous and albuminous demulcent liquids, — as linseed-tea, milk, white of egg, with water, &c. No chemical antidote is known. Oil was at one time thought to be an excellent remedy; but since the discovery of its being a solvent for the cantharidin, suspicion has been entertained that it is calculated to increase, rather than decrease, the patient's danger. This theoretical and plausible objection, first broached, I believe, by Pallas, seems supported by experience. Orfila found that cantharides macerated in cold oil, and afterwards given to dogs, killed them in a few minutes; and Dr. Christison says, " The case mentioned in the Genoa Memoirs was evidently exasperated by the use of oil." I confess, however, I think farther experience is required to determine the hurtful consequences of employing oil; for as the editors of the " *Dictionnaire de Matière Médicale*" very properly observe, on the same principles that oil is prohibited, mucilaginous drinks ought also to be proscribed, since cantharidin, aided by the yellow matter, dissolves in water; and on the other hand oil, in some cases, has appeared to be beneficial. To counteract the effects of cantharides, blood-letting, both general and local, opium, and the warm-bath, must be resorted to. Camphor was at one time highly esteemed for counteracting the effects of cantharides (see p. 795). Oleaginous and mucilaginous injections into the bladder are recommended to relieve the vesical symptoms.

Other Coleopterous Vesicants.

In Europe, the ordinary vesicating insect is the *Cantharis vesicatoria;* but in some other parts of the world other blistering insects are employed. Thus, *Cantharis vittata*, or the *Potatoe-fly*, *C. atrata*, *marginata*, and *cinerea*, are used in North America. In the Brazils, *C. atomaria* has been employed. *C. ruficeps*, a native of Sumatra and Java, is said to possess extraordinary blistering properties. *C. gigas* (*Lytta cærulea*, Pfaff), is a native of Guinea and the East Indies. *C. violacea* (*Lytta gigas mas*, Buchner) is a native of the East Indies. In Arabia, *C. syriaca* (*Lytta segetum*), is said by Förskal to be employed. *Mylabris Cichorii* is used in China and some parts of the East Indies. *Meloe proscarabeus* is an indigenous vesicating insect which has in two instances caused death. *M. majalis* or *true Mayworm* possesses similar properties.

ORDER 2. HEMIPTERA, *Linnæus.*

Two *wings* covered by *elytra*. *Mouth* formed for suction; the *rostrum* composed of a tubular articulated sheath, including four scaly setæ, in place of mandibles and jaws. *Elytra* in some crustaceous, with the posterior extremity membranous; in others almost similar to wings, but more extended, thicker, and coloured (Stark, *Elem. of Nat. Hist.* vol. ii. p. 318.)

Coc'cus Cac'ti, Linn. L. E. D.—*Cochineal Insect.*

(Cocci, *L.*—The entire insects, *E.*)

HISTORY.—The Spaniards, on their first arrival in Mexico, about the year 1518, saw the cochineal employed (as it appears to have been done long before) by the native inhabitants of that country, in colouring some parts of their habitations, ornaments, &c. (Bancroft, *Experim. Researches*, vol. i. p. 413; and Beckmann, *Hist. of Invent.* vol. ii. p. 192).

ZOOLOGY. *GEN. CHAR.*—*Tarsi* with one joint, and terminated by a single hook. *Male* destitute of a *rostrum*, with two wings covering the body horizontally; abdomen terminated by two *setæ*. *Female* apterous, furnished with a rostrum. *Antennæ* of eleven joints, filiform and setaceous.

SP. CHAR.—*Male* very small, with the *antennæ* shorter than the body; *body* elongated, of a deep red, terminated by two long diverging *setæ*; *wings* large, white, crossed over the abdomen. *Female* nearly twice as large as the male, bluish red, covered with a white farina; *antennæ* short; *body* flattened below, convex; *feet* short.

Wings of the male beautifully snow white. The females fix themselves firmly on the plant, which serves them as a habitation, and never quit this spot: here they couple, and increase considerably in size. Each insect lays several thousand eggs, which proceed from the body through an aperture placed at the extremity of the abdomen, and pass under the belly to be there hatched. Death then ensues; the body of the mother dries up; its two membranes become flat, and form a sort of shell or cocoon, in which the eggs are inclosed, and from whence the little cochineals soon proceed. The female only is of commercial value.

Hab.—Mexico.

Cultivation.—The cochineal insects feed on the *Nopal (Opuntia cochinillifera)*. Mr. Ward (*Mexico in* 1827, vol. i. p. 84) says, the plantations are confined to the district of La Mīstĕcā, in the state of Oăxācă, in Mexico. The animals are domesticated and reared with the greatest care. Plantations of these are cultivated for the nourishment of the insects. Here the impregnated females are placed; this operation being denominated *sowing them.* Young ones are soon developed; and some months afterwards, when the females have become fecundated and enlarged, the harvest commences. The insects are brushed off with a squirrel's tail, and killed by immersing them in hot water, and afterwards drying them in the sun, or by the heat of a stove.

Fig. 249.

Opuntia cochinillifera.

Three harvests are made annually; the first being the best, since the impregnated females alone are taken: in the second the young females also are collected; and in the third both old and young ones, and skins, are collected indiscriminately. Before the rainy season commences, branches of the nopal plant, loaded with infant insects, are cut off and preserved in the houses of the Mexicans, to prevent the animals being destroyed by the weather.

Commerce.—In 1839, the quantity of cochineal on which duty (1s. per cwt.) was paid, was 489,997 lbs. In 1838, it was only 204,748 lbs. It is said that, on the average, one pound of cochineal contains 70,000 dried insects.

Description.—Cochineal (*coccus; coccinella*) consists of the dried female insects, which are about one or two lines long, wrinkled, of an irregular figure, convex on one side and flat or somewhat hollow on the other. They are inodorous, have a bitterish warm taste, tinge the saliva violet red, and yield a dark red powder. In burning, they evolve an animal odour, and leave a greyish white ash. By infusion in water they swell up, show their ringed character, and even their feet, giving the liquid a red colour. Both the Honduras and Vera Cruz kinds are distinguished into the silver and black varieties. *Silver cochineal (cochinilla jaspeada* of the Spaniards) has a purplish gray colour; but in all the furrows and depressions we observe a whitish powder, which, examined by the aid of a lens, appears like fine wool. *Black cochineal* (*cochinilla renegrida* or *grana nigra* of the Spaniards) is reddish or purplish black, and devoid or nearly so of the silvery character. *Granilla* (*cochinilla sylvestre* or *grana sylvestra*), consists of very small cochineal insects, and smaller, wrinkled, globular or ovate masses, (cocoons and new-born insects?)

somewhat like fragments of the cochineal insect (see *Granillo*, in Bancroft's *Exp. Research.* vol. i. p. 435).

An extensive system of adulterating cochineal, by a mercantile house in London, was discovered a few years ago. The genuine article was moistened with gum-water, and then agitated in a box or leathern-bag, first with powdered sulphate of baryta, then with bone or ivory-black, to give it the appearance of black cochineal. By this means the specific gravity of the cochineal was increased from 1·25 to 1·35, and 12 per cent. of worthless heavy spar sold at the price of cochineal, (Ure, *Dict. of Arts and Manuf.* p. 305-6). Powdered talc and carbonate of lead have been used to give the silvery appearance. But a lens will readily distinguish these powders from the real wool which gives the true silvery character.

Composition.—Two analyses of cochineal have been made; one by John (*Gmelin, Handb. der Chem.* ii. 1474), the other by Pelletier and Caventou (*Ann. de Chim. et Phys.* viii. 250). The latter chemists found the constituents to be *carmine*, *peculiar animal matter*, *fatty matter*, (composed of *stearine*, *olein*, and an *odorous acid*), and *salts*, (viz. phosphate and carbonate of lime, chloride of potassium, phosphate of potash, and a salt of potash, containing an organic acid).

Cochenillin (*Carmine*).—Obtained by digesting cochineal in ether, to extract the fatty matter, and then in alcohol, which dissolves the carmine. This colouring matter is a brilliant purplish red substance, with a granular or crystalline appearance; unalterable in the air, easily soluble in water and alcohol, but insoluble in ether. It fuses at 112°, F. Chlorine renders it yellow. Acids change its colour. The concentrated mineral acids decompose it. Alkalies render the watery solution of carmine violet. Lime-water forms a violet precipitate with it. The affinity of hydrate of alumina for it is most remarkable: the compound formed by their union is called a *lake*.

The pigment sold in the shops as *carmine*, and which is one of the most valuable colours employed by the painter in water-colours, is a compound, of which cochenillin is one of the constituents. Pelletier and Caventou regard it as consisting of cochenillin, animal matter, and an acid. Some mystery is attached to the manufacture of it. A fine clear day seems essential to the formation of a pigment of the most esteemed quality.

Physiological Effects and Uses.—Diuretic, diaphoretic, antispasmodic, and anodyne qualities, have been assigned to cochineal, but without the least evidence of their existence. A mixture of carbonate of potash and cochineal is a popular remedy for hooping-cough. The only real value of cochineal is as a colouring-matter, and as such it is used both in powder and solution. In the arts it is extensively employed in dying scarlet and crimson, and in the manufacture of *carmine* and *lake*.

Order 3. Hymenoptera, *Linnæus*.

Four naked veined *wings* of unequal size. *Mouth* composed of jaws, mandibles, and two lips. *Lip* tubular at its base, terminated by a labium, either doubled or folded in and forming a kind of sucker. *Females* with a compound ovipositor or sting at the anus (Stark).

A'pis mellif'ica, Linn. L. E. D.—*The Hive Bee* or *Honey Bee.*

(1. Humor è floribus decerptus et ab Ape præparatus, *L.*—Saccharine secretion, *E.*—Mel. *D.* 2. Cera; Concretum ab ape paratum; Cera alba; Idem dealbatum, *L.*—Cera flava; Waxy secretion; Cera alba; Bleached Bees' Wax, *E.*—Cera alba. Cera flava, *D.*)

History.—This animal was very anciently known, and is frequentl referred to in the Old Testament. In all ages it has been an object of admiration and attention, on account of its industry, curious economy, and policy.

Zoology. *Gen. Char.*—*Labium* filiform, composing with the jaws a kind of *proboscis*, geniculate and bent downwards. First joint of the posterior *tarsi* large, much compressed. No spines at the extremity of the last two *legs*. Upper *wings* with one radial and three cubital cells (*Stark*).

Sp. Char.—Blackish. *Abdomen* of the same colour, with a transverse greyish band, formed by the down at the base of the third and following segment (*Stark*).

The honey bee lives in societies, called *swarms*, consisting of from fifteen to thirty thousand individuals. Each swarm is composed of three classes of individuals—viz. a female, males, and neuters. The female, called the *queen bee*, is narrower and longer than the others. The males, termed *drones*, are smaller than the female, and are devoid of stings. In each hive there are from 800 to 1000 drones. Towards autumn, when they can be of no further use, they are destroyed by the neuters. The neuters are termed *working bees*, and are by far the most numerous, since in each hive there are from fifteen to thirty thousand. They are in reality females whose ovaries are not developed, in consequence, as some have supposed, of the nature of the aliment with which they are supplied while in the larva state.

The digestive system of the animal consists of highly developed *salivary organs* communicating with the proboscis, of an *œsophagus* (which enlarges at one part, forming the *crop*, *sucking stomach*, or *honey bag*), *a proper stomach*, *small* and *large intestines*, and *biliary vessels*. The latter open into the alimentary canal immediately behind the stomach. The sexual system, in the *male*, consists of *a pair of testicles*, each having a *vas deferens*, which terminates in a *vesicula seminalis*. From the conjoined extremities of the vesiculæ proceeds *a common duct* terminating in a *penis*. The *female genital organs* consist of *two ovaries* made up of tubes, each containing about twelve *ova*; the *two oviducts* from these ovaries terminate in a *vagina*, into which also opens *a duct* from *a roundish vesicle*. The poison apparatus is found in the females and neuters only. It consists of *two thin convoluted secreting organs*, opening into a *pyriform receptacle*, from which *a small duct* passes to the *sting*, which consists of two portions placed side by side, barbed at the extremity and contained in a sheath. The *poison* is said to be hot and acrid to the taste. The consequences produced by the sting of a bee are pain, redness, swelling, and hardness of the part; and might prove fatal if a swarm were to attack an individual. The removal of the sting (if left within the wound), and friction with saliva, or with oil and hortshorn, is all the treatment usually required.

Hab.—Old continent (*Latreille*.) In a state of nature they reside in hollow trees; but they are almost universally domesticated, and are preserved in *hives*. Curtis (*Brit. Entomol.* xvi. pl. 769) has described and depicted a remarkable instance of the nest of some hive bees attached to the arm of a tree. It was discovered in 1838 by Lord Malmesbury in his plantation near the river Avon.

Bees furnish two products useful in medicine,—viz. *honey* and *wax*.

a. Honey.

Production.—Honey (*mel*) is secreted by the nectariferous glands of flowers, and is collected by the working or neuter bees, who take it up by suction or lapping, and pass it into the dilatation of the œsophagus denominated *crop*, *sucking stomach*, or *honey-bag*; beyond which, we presume, the honey does not pass, as it has never been found in the true stomach. When the animal arrives at the hive, the honey is dis-gorged by a kind of inverted peristaltic motion, and is probably somewhat altered in its properties by the secretions of the crop. It is used by the animal as food.

Physical Properties.—Honey varies in its taste and odour according to the age of the bees, and the flowers on which they have fed. A hive which has never swarmed is considered to yield the best, which is, therefore, called *virgin* honey. The flavour of Narbonne honey, which is so much admired, is said to arise from the labiate flowers on which the animals feed; to imitate this, a sprig of rosemary is sometimes added to the honey obtained from other places.

Clarified honey (*mel despumatum*, D.) is prepared by melting honey in a water-bath, and removing the scum.

Purity.—Flour, it is said, is now and then mixed with honey. It may be readily distinguished by its insolubility in cold water, and by the blue colour produced by the addition of iodine.

The London College directs that honey,—

Is not to be employed without being despumated. Dissolved in water, iodide of potassium and acid being added, it does not become of a blue colour.

Chemical Properties.—The constituents of honey vary somewhat according to the food of the bees, the season, the age of the animals, the mode of extracting it from the combs, &c. It must, however, be regarded at all times as a concentrated solution of *sugar*, mixed with *odorous*, *colouring*, *gummy*, and *waxy* matters. The saccharine matter is of two kinds: one crystallizable, and analogous to the sugar of grapes; the other incrystallizable, and similar to the uncrystallizable brown syrup of the sugar-cane. Guibourt has found also mannite, which differs from sugar in not fermenting when mixed with water and yeast.

Physiological Effects.—Honey is emollient, demulcent, nutritive, and laxative. When fresh it is apt to occasion indigestion and colic. Collected from poisonous plants it has been found to possess deleterious qualities. The honey of Trebizond has long been notorious for its deleterious qualities. Mr. Abbott (*Lond. and Edinb. Phil. Mag.* vol. v. p. 313, for Oct. 1834,) says it causes violent headache, vomiting, and a condition like that of a tipsy man. A larger dose produces deprivation of all sense and power for some hours afterwards. These effects agree with those assigned to this honey by Xenophon (*Anabas.* lib. iv.) in his account of the "retreat of the ten thousand." Pliny (*Hist. Nat.* xxi. 44, ed. Valp.) also speaks of this poisonous honey. Tournefort (*Hist. de l'Acad. Roy. des Sciences*, 1704, p. 351) ascribes its venomous properties to the bees feeding on the *Azalea pontica*. Many other instances of poisonous honey are on record (see Barton, *Phil. Mag.* vol. xii. p. 121 and in Beck's *Med. Jurisprud.*)

Uses.—Mixed with flour, and spread on linen or leather, it is a popular applicaion to promote the maturation of small abscesses and furunculi. It sometimes forms a constituent of gargles, partly on account of its taste, partly for its emollient operation. It is also used as a vehicle for the application of other more powerful agents to the mouth and throat, especially in children. It is sometimes employed as an emollient and demulcent in inflammatory affections. In troublesome coughs, barley water, mixed with honey and sharpened with slices of lemon, and taken warm, forms a very agreeable and useful demulcent to allay troublesome coughs.

Oxymel, L. D. (Honey, lb. ij.; Distilled Vinegar, Oj. [wine-measure]. Boil them in a glass vessel, with a slow fire, to the thickness of a syrup, removing the scum, *D.*—The London College directs lb. x. of honey [clarified] and Oiss. of acetic acid. But there must be some error in the large proportion of acid ordered). Oxymel is employed as a detergent and pectoral. Dose of oxymel as usually found in the shops, ʒj. to ℥j.

β. *Wax.*

Secretion of Bees' Wax.—Bees' Wax (*cera*) was at one time supposed to be merely the pollen of plants elaborated by bees. Bonnet, however, so early as 1768, asserted it to be a secretion from the ventral scales. Hunter (*Phil. Trans.* for 1792, p. 143) and Huber have subsequently proved the correctness of this assertion. The latter writer, indeed, proved that the pollen is not at all essential to the production of wax, for bees fed on honey and water equally secreted it, and formed the usual waxy cells. With this wax they construct the *comb (favus)*, the cells (*alveoli*) of which are hexagonal with angular bottoms. (On their mathematical form, consult Waterhouse in the *Penny Cyclop.* art. *Bee*; and Lord Brougham's *Dissert. on Subjects of Science connected with Nat. Theology*, vol. i. p. 218, 1839.) The substance called *Propolis* is collected by the bees from the buds of trees. It is of a resinous nature, and is used for lining the cells of a new comb, stopping crevices, &c.

Other animals secrete wax. Thus the larva of the *Cicada limbata* or *white wax insect* of China is covered with a waxy powder, which is communicated to the trees upon which these insects are found, and is collected by the natives, who esteem it highly as a medicinal substance. (See Donovan's *Insects of China.*)

Wax is also a product of vegetables; but *vegetable wax* is not employed in this country. *Myrtle wax* is obtained from the berries of the *Myrica cerifera*, a native of the United States of America. These are boiled in water and pressed. The wax exudes, floats on the water, is skimmed off, and is remelted. This kind of wax has a greenish-yellow colour. The *bloom* of plums is owing to a layer of wax. The *wax palm* of the Andes has been already noticed (see p. 617).

Fig. 250.

Cicada limbata.

Preparation.—Wax is extracted from the comb, partly by allowing the latter to drip, partly by subjecting it to pressure. The comb is then melted in water, by which the impurities subside, and the wax is allowed to cool in moulds.

Properties of Yellow Bees' Wax.—Yellow wax (*cera flava*) has a remarkable and peculiar odour; its colour is more or less yellow, but varying in degree; its specific gravity varies from 0·960 to 0·965. It is said to be sometimes adulterated with suet, which gives it a fatty feel and disagreeable taste. Resin may be recognised by its solubility in cold alcohol; bean or pea meal, by its insolubility in oil of turpentine.

Wax Bleaching.—This is effected by melting yellow wax (either in a copper vessel, or in a large vat or tub, by means of steam), running it off, while in the melted state, into a trough, called a *cradle*, perforated at the bottom with holes, and placed over a large water tank, at one end of which is a revolving cylinder, almost wholly immersed in water. By this means the wax is solidified, converted into a kind of ribbon, and conveyed on the surface of the water to the other end of the tank. These ribbons of wax are here lifted out, and conveyed in baskets to the bleaching grounds, where they are exposed to the air for one or two weeks (according to the state of the weather), being turned every day. The wax is then re-melted, re-ribboned, and re-bleached; it is subsequently refined by melting in water acidulated with sulphuric acid.

Properties of White Wax.—White wax (*cera alba; cera dealbatum*) is yellowish-white; I have never met with pure wax perfectly white. The circular cakes of commerce, as well as wax candles, always contain spermaceti, which the dealers add to improve the colour. Pure wax is solid, brittle, inodorous, or nearly so, insipid, fusible, and at a much higher temperature decomposable. Its specific gravity varies from 0·8203 to 0·965.

Composition.—According to John, wax is a compound of two other waxy substances;—the one called *cerine*, the other *myricine*. These have been examined by Boudet and Boissenot (*Journ. de Pharm.* xiii. 38).

1. *Cerine.*—This constitutes at least 70 per cent. of wax. It fuses at 143½ F. It dissolves in 16 parts of boiling alcohol. By saponification with potash it yields margaric acid, a minute portion of oleic acid, and a considerable quantity of a non-saponifiable fat called *ceräine.*

2. *Myricine.*—It fuses at 149° F. It dissolves in 200 parts of boiling alcohol of sp. gr. of 0·833. It is not saponifiable by potash.

Ettling says that cerine, ceraine, and myricine, are isomeric, and composed of $G^{18} H^{19} O$. (Thomson, *Org. Chem.*)

More recently Hess (*Pharm. Central-Blatt. für* 1838, p. 332) asserts that pure wax is homogeneous, and possesses the properties of myricine; its composition being $C^{20} H^{20} O$. The difference between cerine and myricine he ascribes to the presence of *ceric acid* formed by the oxidation of myricin.

Physiological Effects and Uses.—Wax is an emollient and demulcent. It has been administered internally, in the form of emulsion (prepared with melted wax and soap, yolk of eggs, or mucilage), in *diarrhœa* and *dysentery*, especially when ulceration of the alimentary canal is suspected. In these cases it has been used by Hufeland and Wedekind. It has sometimes been employed as *a masticatory*, but its action is mechanical only. Its principal use, however, is *externally*, sometimes as a mild sheathing or protecting application, sometimes as a basis for the application of other agents. It is a constituent of all *cerates*, which take their name from it. The vapour evolved from wax placed on red-hot iron has been inhaled in phthisis.

1. *Emplastrum Ceræ*, L. *Emplastrum simplex*, E. *Emplastrum attrahens.* (Wax; Suet, of each, lb.iij.; Resin, lb.j. *L.*—Bees'-wax, ℥iij. Suet, and Resin, of each, ℥ij. *E.*—"Melt them together with a moderate heat, and stir the mixture briskly till it concretes on cooling." *E.*)—Employed in the preparation of *Emplastrum Cantharidis**. Sometimes used to promote discharge from a blistered surface.

2. *Emplastrum Aromaticum*, D. (Frankincense (*Thus*), ℥iij.; Yellow Wax, ℥ss.; Cinnamon Bark, powdered, ʒvj.; Essential Oil of Allspice; Essential Oil of Lemons, of each, ʒij. Melt the Frankincense and Wax together, and strain; when they are beginning to thicken by cooling,

* The following preparation of cantharides was omitted at p. 1375:—

Emplastrum Calefaciens, D. (Plaster of Cantharides, one part; Burgundy Pitch, seven parts. Melt them with a medium heat [between 100° and 200° F.]; mix well and make a plaster). Employed as a useful stimulant and rubefacient in slight colds, headaches, local pains, &c. In some persons it produces vesication.

mix in the powder of cinnamon rubbed up with the oils, and make a plaster"). By keeping, as well as by the application of heat in spreading, the volatile oils of this preparation are dissipated. "It is used as a stimulant, applied over the region of the stomach, in dyspesia and increased irritability of that organ, to allay pain and nausea and expel flatus" (Montgomery, *Observ. on the Dublin Pharm.*)

3. CERATUM, L. *Unguentum Simplex*, E. *Unguentum Ceræ albæ*, D. *Simple Cerate. Simple Dressing.* (Olive oil, f℥iv. [f℥vss. *E.*]; Wax [Bleached Bees' Wax, *E.*], ℥iv. [℥ij. *E.*]. *L. E.*—White Wax, lb.j.; Prepared Hog's Lard, lb.iv. *D.* Add the oil to the melted wax, and mix [and stir the mixture briskly while it concretes on cooling, *E.*]). A mild and cooling dressing. Sometimes used as a basis for more active preparations.

4. UNGUENTUM CERÆ FLAVÆ, D. (As the preceding, except that Yellow Wax is substituted for White Wax). Effects and uses as the last.

5. LINIMENTUM SIMPLEX, E. (Olive Oil, *four parts;* Bleached Bees'-Wax, *one part.* Dissolve the wax in the oil with a gentle heat; and agitate well as the fused mass cools and concretes). Differs from the Unguentum simplex in its greater liquidity. Used to soften the skin, and to promote the healing of chaps, &c.

Other Hymenopterous Insects.

The tribe of hymenopterous insects, called *Gallicolæ* or *Diplolepariæ*, contains the insects which produce those excrescences on plants commonly denominated *galls* (see *Nutgall*, p. 734, and *Bedeguar*, p. 1128). Latreille (in Cuvier's *Règne Animal*, t. v. p. 291, 1829) comprehends all the insects of this tribe in one genus,—viz. *Cynips.*

CLASS 7. CRUSTACEA, *Cuvier.*

In the stomach of the *Crawfish (Astacus fluviatilis)* are found, at the time the animal is about to change its shell, two calcareous concretions, commonly called *crab's eyes* or *crab's stones* (*lapilli cancrorum*), which were formerly ground and employed in medicine, as absorbents and antacids. They consist of carbonate of lime and animal matter principally, with a little phosphate of lime. Their use is now obsolete. In the shops, imitations of them (prepared with chalk and mucilage, or size) are still met with.

FIG. 251.

Astacus fluviatilis.

The *black-clawed or large edible Crab* (*Cancer Pagurus*) was at one time an officinal animal. Its *claws* (*chelæ cancrorum*) when prepared by grinding, were used for similar purposes to the crab's eyes. Their composition is similar.

Division II. Vertebrata.—Vertebral Animals.

Animals furnished with a *skull* and *vertebral column* for the protection of the brain and spinal marrow.

Class 8. Pisces.—Fishes.

Vertebrated Animals with cold red *blood*, respiring by *gills* or *branchiæ*, and moving in the water by the aid of *fins*.

No article of the Materia Medica contained in the British Pharmacopœias is derived from this class of animals. But it would be unpardonable to omit all notice of *Isinglass*, and the *Oil of the Liver of the Cod Fish*. The important uses of the first substance are well known; and the extraordinary efficacy in various diseases, assigned by some writers to the last-mentioned substance, demands a short notice here.

(I.) ACIPENSER, Linn. The Sturgeons.—The term Acipenser is applied by modern naturalists to designate a particular genus of cartilaginous fishes commonly called Sturgeons, and which are thus characterized:—"Body elongated and angular, defended by indurated plates and spines, arranged in longitudinal rows; snout pointed, conical; mouth placed on the under surface of the head, tubular, and without teeth," (Yarrell, *Hist. of Brit. Fishes*, ii. 360). The species are badly determined. Brandt (*Med. Zool.* ii. 1 & 349) has described and figured eight. *Acipenser Sturio*, or the *Common Sturgeon*, is occasionally caught in the river Thames. The species from which Isinglass (*Ichthyocolla*, from ἰχθὺς *a fish*, and κόλλα *glue*; *Colla Piscium*) is procured, are the following:—

Fig. 251.

Acipenser Sturio.

1. A. Huso, Linn. The *Beluga* or *Bieluga*.—Inhabits the Caspian Sea and its tributary streams. Its roe (ovary) is esteemed as *caviare*. Its swimming bladder, when properly prepared, yields *leaf isinglass* of three qualities, *fine firsts*, *firsts*, and *seconds*.

2. A. Güldenstädtii. Brandt and Ratzeburg. The *Ossetr* or *Osseter*.—Inhabits the Caspian and Black Seas and their tributary rivers. *Caviare* is prepared from its roe (ovary.) From its swimming bladder are obtained both *staple* and *leaf isinglass*. The varieties of the *staple* are, the *Patriarch Astrachan*, and *Astrachan firsts*, *seconds*, and *thirds*. The *leaf* varieties are *firsts*, *seconds*, and *thirds* (T. W. C. Martius, *Lehrb. d. Pharm. Zool.* S. 76. 1838).

3. A. Ruthenus, Linn. The *Sterlet*.—Inhabits the Black and Caspian Seas and their tributary rivers; and the Arctic Ocean. Its roe yields *caviare*. *Leaf* and *book* (*first* and *second*) *isinglass* are obtained from the swimming bladder.

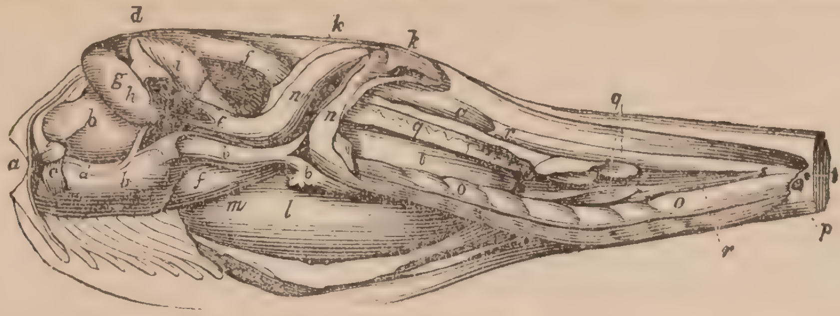
4. A. Stellatus, Pallas. The *Sewruga*.—Inhabits the Caspian and Black Seas, and their tributary rivers. Yields *caviare* and *leaf isinglass*.

The Sturgeons are not the only fishes which yield the substance known in commerce as Isinglass. In New York it is obtained from the *Labrus Squeteague* of Mitchill; in New England *ribbon isinglass* is procured from the intestines of the *Morrhua vulgaris*, or *Common Cod* (*Journ. of the Philadelphia College*, vols. iii. and vi.) In the Brazils it is obtained from some large fish (*Silurus?*) In Iceland it is obtained from the Cod (*Morrhua vulgaris*) and the Ling (*Lota Molva*).

The organ from which isinglass is usually procured is the *air-bag*, or *swimming bladder*, sometimes termed the *sound*. It is a membranous sac filled with air (containing from 69 to 87 per cent. of oxygen), and placed under the spine, in the middle of the back, and above the centre of gravity. In most fish it communicates with the œsophagus, or stomach, by the *ductus pneumaticus*. In others it is an imperforate sac. Occasionally there are two sacs, one anterior to the other, and communicating with each other by a short tube.

The air-bag consists of an external or peritoneal coat, a middle, tendinous, or, in some cases, a muscular coat, and an internal highly vascular membrane. In the *pipe* or *purse* kinds of isinglass the sac is dried unopened. The fishermen of the Caspian prepare isinglass thus:—the fish are placed on rafts and gutted. The roes are removed to make

Fig. 252.



Abdominal Viscera of Acipenser Ruthenus.

b. The liver.
c. The gall-bladder.
d. The gall duct, opening into
e. The duodenum.
f. The proventriculus.
g. The stomach.
h. The pylorus.
i. The pancreas: the duct of which terminates close to the pylorus.
k. The spleen.
l. The swimming bladder.
m. The ductus pneumaticus.
n. and *o.* The intestines.
p. The anus.
q. The ovaries.
r. The oviduct and ureters, forming
s. The common tube, which terminates at *t.*
u. The free opening of the oviduct in the abdominal cavity.

caviare, and the air-bags to yield isinglass. The latter are slit open, washed, and placed in the air with the inner lining upwards. The latter is then scraped off, and the sac being dried unfolded constitutes *leaf* isinglass. Sometimes, however, before it is quite dry, it is rolled and bent like a horse-shoe or a lyre, and is then termed *staple*, (of which two kinds are distinguished, the *long* and the *short*). Sometimes it is folded up into little square packages, forming *book* isinglass.

Ribbon isinglass is prepared from the intestines of the cod. It is imported from America rolled up like a ribbon.

In 1836, I was indebted to a dealer (now deceased) for the following list of the kinds of isinglass, with their prices at that time, known in the London market:—

Form.	Designation.	Price per lb. s.	d.
Staple	Long staple (finest) from Ural	13	6
	Short staple (Patriarch), from Astrachan, very scarce and dear.		
	Short staple (finest), ditto	14	6
	Samovey short staple	6	0
Leaf	Astrachan leaf (finest)	13	6
	Beluga leaf	11	6
	Brazilian leaf, from Para	5	0
	Samovey leaf (finest), from the Caspian	4	6
Book	Samovey book (finest), ditto	4	6
	Ural book	12	0
Purse	Siberian purse	9	0
	Hudson's Bay purse	7	0
Pipe	Pipe isinglass, from Maranham, Brazils	4	6
Ribbon	Ribbon isinglass, New York	4	0
Picked	Picked Astrachan leaf from 11s. to	14	6
	Picked Brazilian leaf	6	6
	Pickings (the brown ends)	8	6

Isinglass was formerly *picked* into shreds by women and children. It is now usually cut by steam-power. When reduced to small threads, it is scarcely possible to distinguish the finest from some of the inferior kinds. The best criteria are its whiteness, its freedom from any unpleasant odour, and its complete solubility in water. The substance called *patent gelatine* is frequently employed as a substitute for isinglass.

Isinglass of fine quality was analyzed by John (Gmelin, *Handb. de Chem.* ii. 1468), who found the constituents to be *gelatine* 70·0, *osmazome* 16·0, *membrane* insoluble in boiling water 2·5, *free acid* (lactic ?) with *salts of potash* and *soda*, and some *phosphate of lime*, 4·0, and *water* 7·0. These results, however, can scarcely be accurate; for dried flesh, as Berzelius (*Traité de Chim.* t. vii. p, 668) observes, does not contain more than 8 per cent. of osmazome; and if isinglass contained 16 per cent. it could not be kept dry when exposed to the air.

Isinglass is emollient, demulcent, and nutritive. It is employed, dissolved in water or milk, and rendered palatable by acid and sugar, as a nutritious substance for invalids and convalescents. Though highly nutritious and easily digestible, gelatine is inferior in both of these qualities to fibrine and albumen.

A solution of isinglass with some tincture of benzoin is brushed over black sarcenet to form *Court Plaster*. It is also employed as a clarifying agent (for coffee, wines, beer, &c.) Some of the constituents (as the colouring matter) of these liquids unite with the gelatine to form insoluble compounds, which precipitate, and in the act of precipitating the gelatine incloses within its parts the matters which rendered the liquid turbid.

II. MORRHUA VULGARIS. THE COMMON COD.—A well-known inhabitant of the Northern Ocean. Its flesh forms a valuable article of food. From its liver is obtained *Cod Oil*, sometimes termed *Cod's Liver Oil* (*Oleum Jecinoris Aselli*), which has of late years acquired considerable reputation on the continent for its remedial powers. It was strongly recommended, in 1782, by Dr. T. Percival (*Lond. Med. Journ.* vol. iii. p. 393), and in 1807, by Dr. Bardsley (*Med. Reports*, p. 18), as a remedy for chronic rheumatism; for which disease, he states, it was in high repute in Lancashire. According to Pennant (*Arctic Zoology*, vol. iii. p. cccv. 1792) it is obtained as follows:—"They take a half tub, and, boring a hole through the bottom, press hard down into a layer of spruce boughs; upon which they place the livers, and expose the whole apparatus to as sunny a place as possible. As the livers corrupt the oil runs from them, and, straining itself clear through the spruce boughs, is caught in a vessel set under the hole in the tub's bottom." A wholesale dealer in oils informs me that cod oil is now procured by boiling the livers of the fish. The German pharmacologists describe two kinds of cod oil,—the one *pale* (*oleum jecinoris aselli album*), the other reddish brown (*oleum jecinoris aselli fuscum* seu *empyreumaticum*). Only one kind is known to dealers in this country. Its colour is chesnut brown; its odour peculiar, like that of boiled cod's liver. A dealer suggests to me that the so-called pale cod-oil must be the southern whale oil. Cod oil has been analyzed by Marder (*Pharm. Central-Batt für* 1837, S. 536). In 200 parts of the red kind (cod oil of English commerce) he found *green soft wax* 0·130, *brown hard resin* 0·56, *gelatine* 0·931, *oleic acid* 95·0, *margaric acid* 8·00, *glycerin* 18·00, *colouring matter* 25·00, *chloride of calcium* 0·2092, *chloride of sodium* 0·1883, and *sulphate of potash* 0·0614 (total 147·6809). Herberger (*Ibid. für* 1839, S. 855) has since obtained 2·586 parts of *iodide of copper*, and 0·441 parts of *bromide of potassium*, from 1000 parts of brown cod oil. Cod oil is extensively employed by curriers in dressing leather. Of late years it has acquired considerable reputation in Germany, as an antiarthritic and antiscrophulous remedy. Taken in the dose of a table-spoonful three times daily it sometimes acts as a laxative, diaphoretic, and diuretic (Schenk, *Hufeland's Journ.* Bd. xxii. 1822). But Taufflied (*Lond. Med. Gaz.* xxv. 846) declares that he never found the oil, in doses of from two to four spoonfuls a day, "exert any appreciable influence upon the urine or perspiration, or produce any disturbance in the economy." The disagreeable flavour of the oil sometimes creates nausea and sickness, but when habit has surmounted the repugnance to it these effects cease. Dr. Bardsley found that most patients were disposed to get fat under the use of it. The diseases in which this oil has been most esteemed are the following:—1stly. In *Chronic gout and rheumatism* its efficacy has been asserted by Günther, Katzenberger, Beckhaus, Spitta, Knod v. Helmstreit, Röseth and others (Dierbach, *Neuest. Entd. in d. Mat. Med.* Bd. i. S. 352, 1837). Taufflied found it useless in gouty arthritis. 2ndly. In *Rachitis* it is said to have been used with distinguished success by Schenk, Schütte, Osberghaus, De Roy, &c. 3dly. In *Scrofula*, Schütte, Gumpert, Lüders, and Taufflied, speak in high terms of its efficacy. It sometimes succeeds where iodine fails. Even in tubercular phthisis benefit has been said to have been gained by its use. 4thly. In *Paralysis*, Schupmann found it beneficial. 5thly. In *Chronic Ophthalmia*, Von Ammon used it with excellent results. 6thly. In *Obstinate Skin Diseases*, Richter found it useful. (For further details concerning the use of this oil consult Richter, *Ausf. Arzneim.* Bd. 1, S. 235; Dierbach, *op supra cit.* and *Neuest. Entd. in Mat. Med.* 1828, p. 270). The dose of this oil for an adult is a table-spoonful three or four times a day, for several weeks, and in some cases for several months! One patient consumed thirty-six lbs. of oil in two years and a half! (Taufflied). Dr. Bardsley gave from ℥ss. to ℥iss. twice or thrice a day, in warm table beer. For children affected with rickets the dose is one or two tea-spoonfuls night and morning. It is usually taken unmixed, but is sometimes exhibited in the form of an emulsion. Peppermint water and lozenges have been recommended to remove the unpleasant taste of the remedy. Some have ascribed the efficacy of the oil to the iodine it contains; but Taufflied denies that the properties of the two are identical, for the one succeeds where the other fails. Is bromine the active agent? *Oil of the Liver of the Ling (Lota Molva)* has been used in the same cases as Cod Oil (Percival, *op. supra cit.* and *Works*, vol. iv. p. 354, 1807).

CLASS 9. AVES.—BIRDS.

Vertebrated animals, with red and warm *blood*, respiring by *lungs*, and the young of which are produced from *eggs*. Body covered with *feathers*, and general conformation organized for flying.

ORDER 1. GALLINÆ, *Linnæus*.—GALLINACEOUS BIRDS.

Bill short, convex, in some genera covered by a *cere*. Upper *mandible* bending from its base or only at the point; nostrils lateral, covered by a membrane, naked or feathered. *Tarsus* long. Three *toes* before, united at their base by a membrane, hind toe articulated on the tarsus above the junction of the anterior toes.

Gal'lus domes'ticus, Temminck.—*The Domestic Cock and Hen.*

Phasianus Gallus, Linn. *L. E.*

(Ovum, *L.*—The Egg, *E.*)

HISTORY.—No mention is made of this animal in the Old Testament. Both the male and female are referred to in the New Testament (Matthew xxvi. and xxiii.) Aristotle (*Hist. de Animal.*) calls the cock ἀλεκτρυὼν,—the hen ἀλεκτορίς.

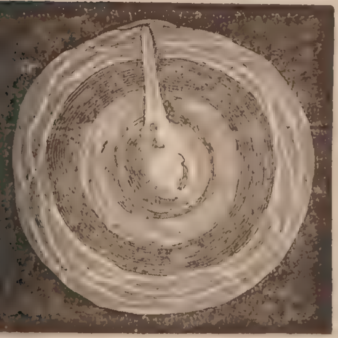
ZOOLOGY. *GEN. CHAR.*—*Bill* of medium size, strong, base naked. Upper *mandible* arched convex, bent towards the point. *Head* surmounted by a crest or plume. *Ears* naked. Three *toes* before, united to the first joint; the hind toe raised from the ground. *Tarsus* with a long and bent *spur*. Middle *feathers* of the tail arched. *Wings* short.

SP. CHAR.—*Comb* dentated. *Throat* wattled. *Feathers* of the neck linear and elongated. *Body* variegated with beautiful colours. *Tail* compressed and ascending. *Comb* and *wattles* of the female less than those of the male.

Some doubt exists as to the origin of our domestic cock and hen. Sonnerat (*Voy. aux Ind. Orient.* ii. 148) affirms, that all the varieties originate from the *Jungle Fowl (Gallus Sonnerati)*; while Temminck refers them to the *Javan Fowl (Gallus banckiva)*.

STRUCTURE OF THE OVARIUM AND DEVELOPEMENT OF THE EGG.—The *OVARIUM* (*racemus vitellorum*) or *egg-organ*, consists of a cluster of ova, in a hen beginning to lay about 500 in number. The stalk by which each ovum is attached to the ovarium is called the *petiolus*. The size of the ova is exceedingly various: when quite ripe, they are as large as the yelk of an egg; the smaller ones are white, the larger ones yellow. Each ovum, when ripe, is composed of a *calyx*, the *yelk-bag*, and the *yelk*. The *calyx* constitutes the outer coat or covering of the ovum, and consists of two layers—an outer one, derived from the peritoneum, and an inner one, which is somewhat thicker. Between these two coats the vessels ramify. The *petiolus* is merely a prolongation of the calyx: it is studded with a number of small ova resembling vesicles. On that part of the calyx of a ripe ovum which is opposite the petiolus, is a whitish curved stripe, called the *stigma*, indicating the spot where the calyx bursts, to allow the escape of the yelk. The *yelk bag*, or *membrana propria vitelli*, is within the calyx, and closely invests the yelk. It is a flocculent, delicate, fine coat.

FIG. 253.



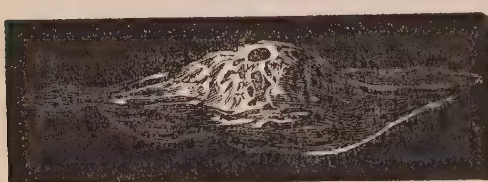
A Segment of the Yelk.

(The division has been made in the direction from the cicatricula to the centre).

In the early state of the ovum, the *yelk* is constituted of a pellucid fluid lymph, and is hardly distinguishable from the *vesicula cicatriculæ*. It then becomes whitish, and subsequently yellow; globules of oil making their appearance. In a ripe ovum, it is viscid, tenacious, and of an orange-yellow colour; and lies in the calyx, with its long axis towards the petiolus. It is composed of three layers, the middle one having the deepest colour; the inner most enclosing a white fluid called the *albumen centrale* (or *substantia alba vitelli*), from which passes *a little canal* to that part of the surface of the yelk called the *cicatricula*.

The internal surface of the yelk-bag is lined with a very thin stratum of globules, in form and figure like those of the blood, but arranged organically. The *cicatricula*, or *tread* (as it is improperly called), is formed by an accumulation of these globules forming a mammiform heap, the convexity of which is towards the centre of the yelk, and is usually situated nearer the petiolus than the stigma. In the top of this is the so-called pellucid *pore*, which is occupied by a small vesicle discovered by Purkinje (*Symb. ad ovi avium histor. ante incub.* Lipsiæ, 1830), and called by him the *vesicula germinativa*, or *vesicula cicatriculæ*. It is found in all the ovarian ova, and seems to be a natural organ, since it is found in the ova of fowls which have never had access to the male. When the yelk falls into the infundibulum, this vesicle disappears.

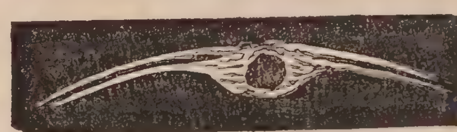
Fig. 254.



Cumulus cicatriculæ.

The convex portion faces the yelk. On the top is a small crater, the inner opening of the *pore*.

Fig. 255.



Section of the Cicatricula, shewing the vesicula in sitù.

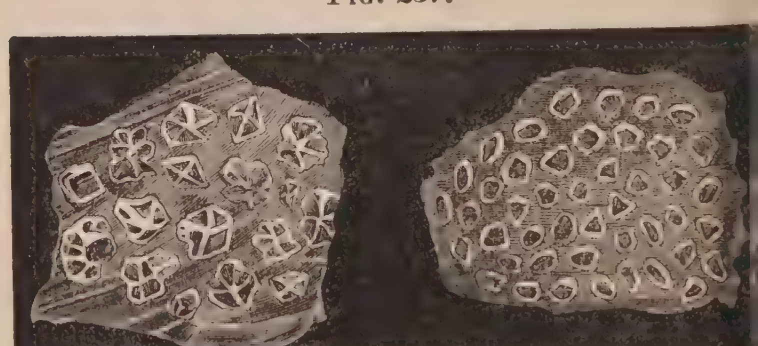
The Oviduct has some resemblance to a convoluted intestine. It is situated on the left side of the animal. Its superior expanded free extremity is called the *infundibulum*, the edges of which are fimbriated. Inferiorly, the oviduct opens into the cloaca. It is attached to the spine by the *mesometrium*. The *infundibulum*, or expanded portion of the tube, receives the ovum as it escapes from the calyx of the ovarium. The upper part of the oviduct is lined by a fine villous membrane, covered with follicles secreting the albumen, or glaire, and thrown into a number of longitudinal folds. The first layer of albumen which the ovum receives forms the *membrana chalazifera* of Dutrochet; at either end of which is a soft, pellucid, albuminous nodule, which may be regarded as the *rudimentum chalazarum*. During the descent of the ovum in the oviduct, it receives fresh deposits of albumen; and, as it undergoes spiral rotations in its passage, the above-mentioned processes become curved

Fig. 256.

Yelk, and its Appendages.

The *spiral chalazæ* are seen at the extremities of the yelk; the circular *cicatricula* in the middle; and the *zona albicans* extending from one chalaza to the other.

Fig. 257.



Polygonal pieces (crystals?) *of Chalk, forming the rudiments of the Shell of the Egg.*

spirally, and in the perfect egg constitute the *chalazæ*, *grandines*, *appendices albuminis*, or the *poles* or *treddles*. From one chalaza to the other are observed, in many eggs, one or more white striæ, formed by a thickening of the membrana chalazifera. Vicq d'Azyr called this appearance the *zona albicans*.

The *albumen*, *glaire* or *white* of the egg, is not uniform in its consistence. The thickest portion is that which is first deposited around the yelk. Proceeding from without inwards, the three layers of albumen are denominated *albumen primum*, *a. secundum*, and *a. tertium*. Just before the egg arrives at that part of the oviduct called the uterus, it receives its outer coat, the *pellicula ovi*. In the middle, or so-called uterine portion of the oviduct, is formed the *calcareous shell*. Some eggs are expelled without it; these are termed *oon eggs*. The chalk is first deposited in small polygonal pieces, having a crystalline appearance; but, when the deposit has attained a certain thickness, all traces of crystallization are lost.

Hab.—Domesticated in all the four quarters of the globe.

Description.—Eggs (*ova*) are too well known to need much description. Their specific gravity varies from 1·080 to 1·090. By keeping they become lighter, by the evaporation of a portion of the water. Dr. Prout (*Phil. Trans.* for 1822, p. 377) found, that in two years an egg lost $544\frac{3}{10}$ grains. The relative weights of the different parts of the egg are, according to the same authority, as follows:—*shell and membrane*, 106·9; *albumen*, 604·2; *yelk*, 288·9; (total, 1000). By boiling in water an egg loses two to three per cent.

1. Egg-shell (*Testa Ovi; Putamen Ovi*).—This consists, according to Prout, of *carbonate of lime*, 97; *phosphate of lime and magnesia*, 1; *animal matter, with traces of sulphur and iron*, 2. The chalk renders the egg absorbent and antacid: hence its use to neutralize the acidity of wines.

2. Pellicula Ovi (*Membrana Putaminis*).—An albuminous membrane which lines the shell. It is soluble in alkalies, and from its solution is precipitated by acids. It weighs about 2·35 grains (the whole egg being supposed to be 1000 grains). At the larger end of the egg it forms the *follicula æris;* the air of which, according to Bischoff, contains 23·475 per cent. of oxygen.

3. White or Glaire (*Albumen* seu *Album Ovi*) consists of two or three laminæ, which are not homogeneous, as two parts at least are discernible,—viz. a solid, probably organized albumen, having the appearance of a very fine delicate membrane, forming a series of cells, in which is contained the liquid albumen. Glaire or white of egg consists, according to Gmelin, of *albumen* 12·0, *mucus* 2·7, *salts* 0·3, and *water* 85·0. The coagulability of albumen by heat distinguishes it from caseum. Albumen or glaire (or *ovalbumen*) is distinguished from albumen of the serum of the blood (*seralbumen*) by its being coagulated by ether.

4. Yelk (*Vitellus Ovi*) is a kind of yellow emulsion, consisting of oil suspended in water by means of albumen, and inclosed in a sac called the *yelk bag*. On its upper surface is seen the cicatricula. At the extremities are the twisted flocculent *chalazæ*. The yelk consists of *yellow oil, with crystallizable fat*, 28·75, *albumen* containing *phosphorus* 17·47, *water* 53 8. The yellow oil (*oleum ovi*) may be obtained by boiling the yelk hard, and digesting in alcohol, which dissolves the oil. By distilling off the alcohol from the filtered tincture, the oil is left behind.

Physiological Effects and Uses.—Both the glaire and the yelk are highly nutritive; the latter, on account of the oil which it contains, is somewhat less easy of digestion than the white. Both are more readily assimilated when in the soft state than when hardened by heat. Considered as medicinal agents, they are emollient and demulcent. The glaire is a valuable agent in the treatment of poisoning by bichloride of mercury (see p. 479), sulphate of copper (see p. 494), and the bichloride of tin. Its efficacy in these cases depends on its chemical properties. The glaire is also used as a demulcent or sheathing agent in all cases of corrosive or acrid poisons. The yelk is a constituent of the *mistura* *spiritûs vini gallici* (see p. 1226). It is also used for preparing emulsions. Its oil has been applied to cracked nipples.

The white or glaire is employed as a clarifying agent for wines and some other liquids. Its efficacy depends on its coagulation, by which it entangles in its meshes the impurities, with which it either rises to the surface or precipitates. When the liquid to be clarified does not spontaneously coagulate the albumen, it is necessary to apply heat. Bookbinders use the glaire as a varnish.

Class 10. Mammalia, *Linnæus.*—Mammals.

Vertebrated animals with red and warm *blood,* breathing through *lungs, viviparous* and suckling their young with milk formed in their breasts or *mammæ.*

Order 1. Cetacea, *Linnæus.*

Body pisciform, terminated by a caudal appendage, cartilaginous, and horizontal. Two anterior extremities formed like *fins,* having the bones which form them flattened and very soft. *Head* joined to the body by a very short thick neck. Two pectoral or abdominal *mammæ. Ears* with very small external openings. *Brain* large. *Pelvis* and *bones* of the posterior extremities represented by two rudimentary bones lost in the flesh.

Physe'ter macroceph'alus, Linn. L. E.—*Great Headed Cachalot.*

(Concretum in propriis cellulis repertum, *L.*—Cetine nearly pure, *E.*—Cetaceum, *D.*)

History.—Cuvier (*Rech. sur les Ossemens Foss.* t. v. p. 328) is of opinion that this animal is perhaps the *Physeter* of Pliny (*Hist. Nat.* ix. 3, and xxxii. 53, ed. Valp.),—the *Orca* of some other Latin writers.

Zoology. *Gen. Char.*—Inferior *teeth* eighteen to twenty-three on each side of the jaw. *Upper jaw* broad, elevated, without teeth, or with these short and concealed in the gum; *lower jaw* elongated, narrow, corresponding to a furrow of the upper, and armed with thick and conical teeth entering into corresponding cavities in the upper jaw. *Spiracular orifices* united at the upper part of the snout. *A dorsal fin* in some species, a simple eminence in others. *Cartilaginous cavities* in the superior region of the head, filled with *oily matter.*

Fig. 258.

Lateral view of the skull of the Physeter macrocephalus.

a. Maxilla.
b. Intermaxilla.
c. Vomer.
d. Parietal bone.
e. Zygomatic apophysis.
f. Jugal bone.
g. Occipital bone.

Sp. Char.—Lower *teeth* twenty to twenty-three on each side, recurved and pointed at the extremity. Small conical teeth concealed in upper gums. *Tail* narrow and conical. *A longitudinal eminence* on the back above the anus. Upper part of the body blackish or slate blue, a little spotted with white. *Belly* whitish. *Length* forty-five to sixty feet.

The *snout* of the cachalot, notwithstanding its prodigious length, is formed only by the maxillæ on the sides, by the intermaxillæ towards the median line, and by the vomer on this line. The intermaxillæ project to form the anterior part of the snout. Posteriorly the right one ascends higher than the left. The *spout hole* is single (in most cetacea it is double), and directed towards the left side, so that whenever the animal spouts water, it is to that side only.

Seat of Spermaceti. — Spermaceti is found in several parts of the body of the animal, mixed with the common fat. The head, however, is the grand reservoir for it. Here it is found (mixed with oil) in a large excavation of the upper jaw, anterior to, and quite distinct from, the true cranium which contains the brain. Mr. Hunter (*Phil. Trans.* vol. lxxvii. 390) states that the spermaceti and oil are contained in cells, or cellular membrane, in the same manner as the fat in other animals; but that besides the common cells there are larger ones, or ligamentous partitions going across, the latter to support the vast load of oil, of which the bulk of the head is principally made up.

There are two places in the head where this oil lies; these are situated along its upper and lower part: between them pass the nostrils, and a vast number of tendons going to the nose and different parts of the head. The purest spermaceti is contained in the smallest and least ligamentous cells. It lies above the nostril, along the upper part of the head, immediately under the skin and common adipose membrane. These cells resemble those which contain the common fat in the other parts of the body nearest the skin. That which lies above the roof of the mouth, or between it and the nostril, is more intermixed with a ligamentous cellular membrane, and lies in chambers whose partitions are perpendicular. These chambers are smaller the nearer to the nose, becoming larger and larger towards the back part of the head, where the spermaceti is more pure.

Mr. Hunter discovered about the nose, or anterior part of the nostril, a great many vessels having the appearance of a plexus of veins, some as large as a finger. On examining them, they were found loaded with spermaceti and oil; and some had corresponding arteries. They were most probably lymphatics, whose contents had been absorbed from the cells of the head.

Hab.—Pacific Ocean, Indian and Chinese Seas. Especially off New Guinea and parts adjacent, Timor, Australasia, Polynesia, Peru, &c.

Extraction of Spermaceti.—In the right side of the nose and upper surface of the head of the whale is a triangular-shaped cavity, called by the whalers "the case." Into this the whalers make an opening, and take out the liquid contents (oil and spermaceti) by a bucket. The dense mass of cellular tissue beneath the case and nostril, and which is technically called "junk," also contains spermaceti, with which and oil its tissue is infiltrated. The spermaceti from the case is carefully boiled alone, and placed in separate casks, when it is called "*head matter*" (Beale, *Nat. Hist. of the Sperm Whale*, p. 186, 1839).

Purification. — The substance called "*head matter*" consists of spermaceti and sperm oil. Its colour is yellow. Its consistence varies with the temperature. In cold weather it consists of a congealed mass (spermaceti) surrounded and infiltrated by oil. To separate the latter as much as possible, it is put into filter bags. The solid thus obtained is then submitted to compression in hair bags, placed in an hydraulic press. It is then melted in water, and the impurities skimmed off. Subsequently it is remelted in a weak solution of potash. It is then fused in a tub by the agency of steam, ladled into tin pans, and allowed slowly to concrete into large, white, translucent, crystalline masses.

Properties.—Commercial spermaceti (*cetaceum; sperma ceti*) usually contains a minute portion of sperm oil, which is best removed by boiling in alcohol. Absolutely pure spermaceti (called *cetine*) is a white laminated substance, without taste, and almost odourless. By the addition of a few drops of alcohol or almond oil, it may be reduced to powder. It is insoluble in water, and slightly soluble only in alcohol, even at a boiling temperature. By saponification with potash, 100 parts of spermaceti yield 60·96 parts of margaric and oleic acids, 40·64 parts of ethal, and 0·9 parts of a yellow extractiform substance.

Ethal is a crystalline solid, composed of $C^{16} H^{17} O$. By distillation with phosphoric acid, it yields an oily substance called *cetene*, composed of $C^{16} H^{16}$. So that ethal may be regarded as a hydrate of cetene.

COMPOSITION.—The ultimate analysis of pure spermaceti or cetine was made by Chevreul (Gmelin, *Handb. d. Chem.* ii. 440). The proximate composition of the same substance has been ascertained by Dumas and Peligot (*Ann. de Chim. et de Phys.* t. lxxii. p. 5).

Chevreul's Analysis.		*Dumas and Peligot's Analysis.*						
			At.	Eq.Wt.			At.	Eq.Wt.
Carbon	81·660	Margaric acid	2	1064	or	Margarate of Cetene	2	1288
Hydrogen	12·862	Oleic acid	2	1040		Binoleate of Cetene	1	1152
Oxygen	5·478	Cetene	3	336		Water	3	27
		Water	3	27				
Cetine	100·000	Cetine	1	2467	or		1	2467

PHYSIOLOGICAL EFFECTS AND USES.—Emollient and demulcent. Internally it has been employed in irritation and inflammation of the alimentary canal (as diarrhœa and dysentery) and of the bronchial membrane (catarrh); but its internal administration is now nearly obsolete. Its principal medicinal use is in the preparation of cerates and ointments.

ADMINISTRATION.—When employed internally it is generally exhibited in the form of an emulsion (*spermaceti mixture*) made with the yelk of egg. Or it may be made with mucilage.

1. *CERATUM CETACEI*, L. *Ceratum simplex*, E. *Unguentum Cetacei*, D. (Spermaceti, ℥ij.; White Wax, ℥viij.; Olive Oil, Oj. *L.*—Olive Oil, 6 parts; Bleached Bees'-wax, 3 parts; Spermaceti, 1 part, *E.*—White Wax, lb.ss.; Spermaceti, lb.j.; Prepared Hogslard, lb.iij. "Heat the oil gently, add the wax and spermaceti, stir the whole briskly when it is fluid, and continue the agitation as it cools," *E.*)—If cold oil be added to the melted wax and spermaceti, the preparation is apt to be somewhat lumpy. As the white wax of commerce is always largely mixed with spermaceti, this preparation has never the precise composition intended by the College. Practically, however, this is of no consequence.—This preparation is employed as a mild and simple dressing for blisters and excoriated surfaces.

2. *UNGUENTUM CETACEI*, L. (Spermaceti, ʒvj.; White Wax, ʒij.; Olive Oil, f℥iij. Having melted them together with a slow fire, stir assiduously until they become cold).—A softer preparation than the preceding, but used in the same cases.

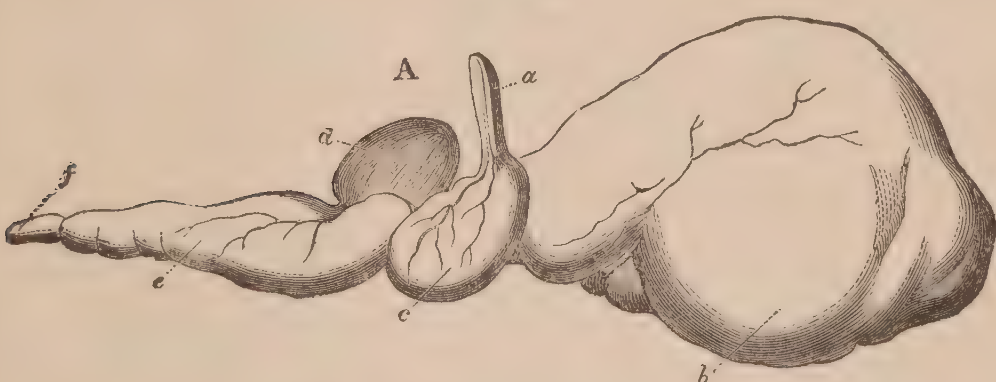
The substance called AMBERGRIS (*Ambra grisea*) is procured from the Cachalot or Sperm Whale (*Phil. Trans.* vol. lxxiii. p. 226, for the year 1783). In this country it is used as a perfume only: on the continent it is employed in medicine. It appears to be the indurated fæces (perhaps somewhat altered by disease) of the animal. Mr. Beale (*op supra cit.* p. 135) collected some of the semi-fluid fæces, and found that the dried mass had all the properties of ambergris. It is a solid, opaque, greyish, striated substance having a pleasant musk-like odour, and which is supposed to be derived from the Squid (*Sepia moschata*) on which the animal feeds; and in support of this opinion it must be mentioned that the horny beaks of this animal are found imbedded in the masses. Its sp. gr. is 0·908 to 0·92. John analyzed it, and found it to consist of *a peculiar non-saponifiable fat (ambreine)* 85, *sweet balsamic alcoholic extract, with benzoic acid*, 2·5, *aqueous extract, benzoic acid*, and *chloride of sodium* 1·5. *Ambreine* is soluble in alcohol, and by the action of nitric acid furnishes a peculiar acid called *ambreic acid.* The *effects* of ambergris on the system are said to be analogous to those of musk. In the shops is kept an alcoholic tincture (called *essence of ambergris*) which is employed as a perfume only.

ORDER 2. RUMINANTIA, *Cuvier.*—RUMINANTS.

PECORA, *Linnæus.*

No *incisors* in the upper jaw; in the lower usually eight; a vacant space between the incisors and molars, but in which, in some genera, are found one or two canines. *Molars* twelves in each jaw, the crown marked with two double crescents of enamel, of which the convexity is outwards in the lower jaw, and inwards in the upper. No *clavicles. Extremities* disposed for walking. Two *toes* furnished with hoofs; metacarpal and metatarsal bones united. Four *stomachs*; *intestines* long. Two or four inguinal *mammæ. Horns* in the males, and often in the females of most species.

FIG. 258.



The four Stomachs of the Sheep.

a, The gullet.—*b*, The paunch.—*c*, The honeycomb.—*d*, The manyplies.
e, The reed.—*f*, The commencement of the duodenum.

Mosc'hus moschif'erus, Linn. L. E. D.—*The Musk Animal.*

(Humor in folliculo præputii secretus, *L.*—Inspissated secretion in the follicle of the prepuce, *E.*—Concretum *Moschus* dictum, *D.*)

HISTORY.—Aristotle, Pliny, Ælian, and Oppian, make no mention of this animal. Ætius (*Serm.* xvi. t. ii. cap. cxiii.) is the earliest writer who notices the perfume. None of the etymologies hitherto given for the word *Musk* (μόσχος) are satisfactory.

ZOOLOGY. GEN. CHAR.—*Incisors* $\frac{0}{8}$. *Canines* $\frac{1}{0}-\frac{1}{0}$. *Molars* $\frac{6}{6}-\frac{6}{6}=34$. *Canines* wanting altogether in the females; superior canines large in the males. *Ears* long, pointed. *Body* slender, *Feet* with hoofs, separated and enveloping the last phalanges. *Tail* very short. Two inguinal *mammæ.*

FIG. 259.

Moschus moschiferus.

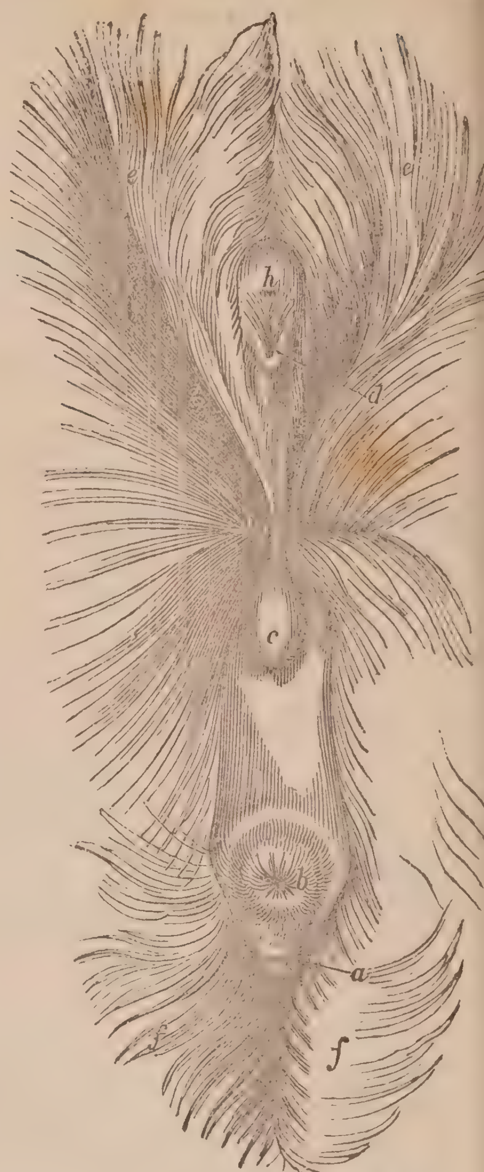
SP. CHAR.—*Fur* of a gray-brown; *hair* coarse. A *pouch* before the prepuce of the male, filled with an unctuous musky substance. *Size* of the roebuck.

The absence of *horns* and the presence of canine teeth distinguish the animal from the Deer (*Cervus*). The *Stylocerus moschatus* is

Fig. 260.

Skull of Moschus moschiferus.

Fig. 261.



Belly of Moschus moschiferus.
(From Pallas.)

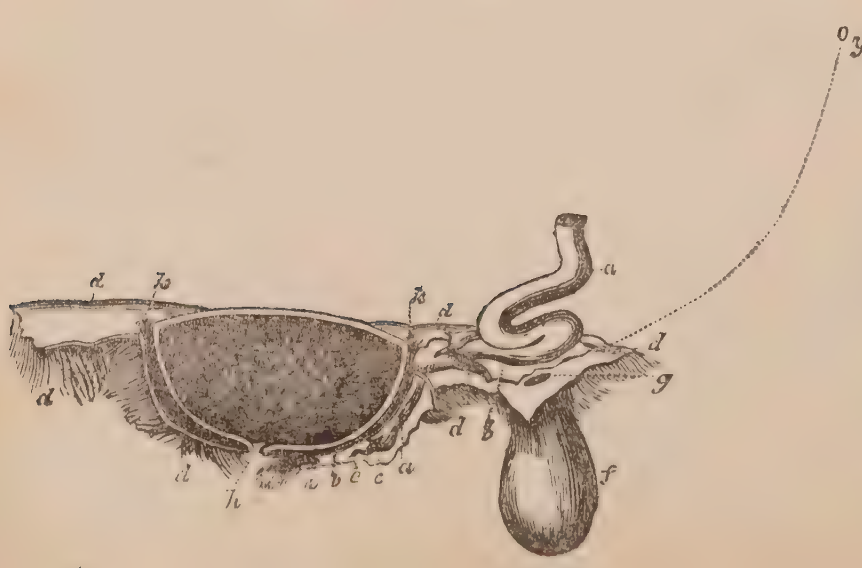
a. Tail. *b.* Anus. *c.* Scrotum. *d.* Preputial orifice. *e.* Abdomen. *h.* Orifice of the musk sac.

the connecting link between the deer and the musks. It has the horns of the one, and the canine teeth of the other.

The most interesting part of the musks is the *preputial musk sac*. Cuvier (*Règne Animal*, i. 259, nouv. ed. 1829) says no other species of Moschus possesses a musk sac; but this statement is not correct. *M. Altaïcus* Eschscholtz (*M. Moschiferus Altaicus* Brandt), *M. Napu*, and *M. Javanicus*, are are also said to possess musk sacs.

Anatomy of the Musk Sac.—The sac is peculiar to the male animal. If he be supposed to be laid on his back, and the belly examined, we observe behind the navel, and immediately in front of the preputial orifice, a small aperture (*external aperture of the musk sac*) leading into the *musk canal*, which terminates in the cavity of the *musk sac*. This aperture is about half an inch from the umbilicus, and usually about a line, or a line and a half, from the preputial orifice. In some preparations in my possession the distance is much greater. The preputial orifice is somewhat more prominent, and has a number of longish hairs projecting from it, in the form of a brush or hair-pencil; whereas the external musk aperture is placed in a depression, and is smooth. The relative position of the parts is shewn by the subjoined sectional view of the musk-sac *in sitû* (from Brandt):

Fig. 262.



a. The penis.
c. Urethra.
d, d, d. The hide.
e. Glans penis.
f. Scrotum.
g. Spot where the spermatic cord is cut off.
h. Aperture of the musk-sac.
i. Preputial orifice.
k, k. Muscular coat of the sac.
y. Position of the anus.

The *musk sac* is of an oval form, rather broader at the anterior than at the posterior part. It is flat and smooth above where it is in contact with the abdominal muscles, but convex below, (supposing the animal standing). Its breadth is from $1\frac{1}{4}$ to $1\frac{3}{4}$ inches; its length from 2 to $2\frac{1}{2}$ inches; its depth varies, being greatest anteriorly, where it is about one-half or 3-4ths of an inch. The *external aperture* of the musk sac is placed in the median line, but nearer to the anterior than the posterior extremity of the sac. The *musk canal* is about 1 or $1\frac{1}{2}$ lines long, its diameter being about one line. The *internal aperture* of the musk sac is surrounded by fine hairs, which readily fall off, and are found in the musk of commerce.

FIG. 263.

Musk Sac.

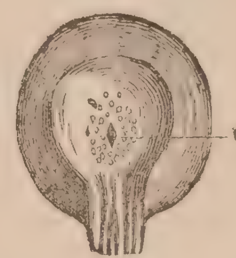
a. Truncated penis.

FIG. 264.

Musk Sac, deprived of its hairy coat, to shew its muscular coat.

a. Portion of the truncated Penis.
c. Aperture of the Musk Sac.

FIG. 265.



Musk Sac, deprived of its hairy coat and circular muscular fibres.

c. Aperture of the Musk Sac.

The following are the parts of which the musk sac consists:—

1. *Outer or hairy coat or skin.*—This is a continuation of the hide, and covers the convex portion of the sac. Its hairs are stiff but smooth, and disposed in a circular manner around the external musk orifice.

2. *Muscular coat.*—This consists of two strata of fibres which surround the sac in a circular form. Pallas (*Spicileg. Zoolog.* fasc. xiii.) states, that they arise from the groin and unite anteriorly with the panniculus carnosus. He regards them as the compressors and retractors of the follicle and of the prepuce when the genital organ is thrust out. The same naturalist has described two retractors of the penis.

Between the two strata of muscular fibres is placed the *penis*, which is remarkable from the circumstance of the urethra projecting beyond the extremity of the glans. In its usual state the penis lies rolled up within the belly.

FIG. 266.

Penis of the Moschus moschiferus.

a. Prepuce.
b. Glans penis.
c. Urethra.

On the inner surface of the muscular fibres is a number of small oblong or roundish *glands* (see FIG. 265), compared by Pallas to the meibomian glands of the palpebræ.

3. *Fibrous coat.*—This is the most external of the proper coats of the musk sac. On its inner surface are numerous depressions or cells, surrounded by ramifying folds, within which the blood-vessels ramify. This coat is continuous (through the musk orifice) with the corium.

4. *Pearly coat.*—A soft delicate membrane, shining like mother-of-pearl. It lines the cells, and covers the folds of the fibrous coat.

5. *Epidermoid coat.*—It is the inner lining of the sac. Its external layer is silvery white; its internal one yellowish or reddish-brown.

6. *Musk glands.*—In each of the depressions observed on the internal coat of the musk sac, are found two or more irregular shaped bodies of a yellowish or reddish-brown colour. These bodies consist of a central brownish mass (supposed to be glandular), covered by a fine membrane.

7. *Contents of the Musk Sac.*—Pallas found, that, in young animals, the sac was empty and contracted. In the adult animal it contained about a drachm and a half of musk, and in old animals more than two drachms. But these quantities must be below the average, since the dried pods of commerce contain on the average more musk than this. Mr. Campbell (*Journ. of the Asiatic Soc. of Bengal*, vol. vi. p. 119, Calcutta, 1827) describes the musk found in the sac as soft, reddish-brown, granular, and having

the appearance of soft gingerbread. (For further details respecting the structure of the musk sac consult Brandt and Ratzeburg, *Med. Zool.* Bd. i.)

HAB.—Asia, between 16° and 58° north latitude, and 92° and 155° of east longitude. Especially on the Atlas and Himalayan ranges. China, Cochin-China, Tonquin, Tartary, and Siberia, have all been celebrated for the musk. The animal is timid, and dwells in cold mountainous districts, where coniferous plants abound.

CAPTURE OF THE ANIMALS.—Various methods of catching the animals are adopted. Sometimes they are taken by snares or gins, sometimes by pitfalls, sometimes by shooting them. The Tungouses, one of the native tribes of Siberia, employ the bow and arrow only.

DESCRIPTION.—Three kinds of musk are described, viz. *China*, *Russian* (or *Kabardine*), and *Bucharian*. I am acquainted with the two first only.

1. *CHINA*, *TONQUIN*, or *THIBET MUSK*, (*Moschus tunquinensis* seu *tibetanus*). This is imported in small rectangular boxes (*catties*), about 7¾ inches long, 4⅜ inches broad, and 4½deep; covered externally by silk, and lined with sheet-lead and paper. These boxes contain about twenty-five sacs, or pods, each wrapped separately in paper. On the outside of the lid of some of the boxes is marked "*Lingchong Musk*;" and on the inside of the lid is a rude Chinese representation of the musk hunters, some shooting the animal, others cutting out the musk-bag. On the paper, which envelopes each pod, are similar rude representations in blue or red ink.

Pod musk (*moschus in vesicis*) consists of roundish, or somewhat oval, pods, which are generally broader at one end than at the other. The hairs are brownish-yellow, or greyish, or whitish, bristle-like, and stiff; arranged in a concentric manner around the orifice of the sac. A careful examination will always discover the remains of the penis. The pods are about 2½ inches long, and 1¾ inches broad. The weight of each pod, as well as of the contained musk, is very variable. I am indebted to Mr. Noakes, druggist, of Snow Hill, for the following account of the weights of six pods, and of the grain musk obtained therefrom :—

Pods of Musk.	*Weight.*	*Contents.*
1	ʒvss.	Grain Musk, ʒxvj. grs. xv.
1	ʒivss.	
1	ʒviij. grs. xxxvijss.	
1	ʒix. grs. xlvijss.	
1	ʒv. grs. xx.	
1	i ijss	
Total 6	ʒxxxvij. grs. xv.	ʒxvj. grs. xv.
Average 1	ʒvj. grs. xijss.	ʒij. grs. xliiss.

Grain musk (*moschus in granis; moschus ex vesicis*) is granular, unctuous to the feel, mixed with hairs, of a dark reddish-brown colour, a bitter aromatic taste, and a strong, remarkable, very persistent smell (*musky odour*). Its odour can scarcely be called peculiar, since it is common to several animals and vegetables. Thus the musk-ox and the musk-cat evolve it. The submaxillary gland of the crocodile secretes an unctuous musky substance. Among plants, Erodium moschatum, Malva moschata, and Centaurea moschata, may be referred to as possessing a musky odour. When mixed with other scents, musk has the remarkable property of augmenting and improving their smell, without much imparting its own: hence it is extensively used by perfumers. A few drops of potash added to musk increases its odour, by setting free, it is supposed, ammonia.

2. SIBERIAN, RUSSIAN, or KABARDINE MUSK *(Moschus sibiricus, rossicus,* seu *cabardinus).* This is an inferior kind. The pods are said to be more oblong or oval than those of the China kind; the hairs longer and whiter. But I have examined large quantities of Siberian musk, the pods of which were not distinguishable from those of the China kind by any of these characters. The only invariable distinction I have observed is in the scent, which is remarkably different: it is much less powerful, and more nauseous and disagreeable, being somewhat empyreumatic. Geiger says, it is sometimes accompanied by an odour similar to that of the sweat of a horse. This kind of musk is imported in wooden boxes, and all the pods that I have examined were in a good state of preservation; but frequently, I am told, this is not the case.

BUCHARIAN MUSK (*Moschus bucharicus*) is described by some pharmacologists, but I have never met with it. The hairs are said to be yellowish or reddish-brown. The musk has a weak odour, and is of very inferior quality.

ADULTERATION.—The great sophisticators of musk are the Chinese. I have seen several *artificial* pods of musk which had been imported from Canton. T. W. C. Martius (*Lehrb. d. pharm. Zool.* S. 39, 1838) calls this artificial kind *Wampo Musk*, and says that, for some years past, it has been extensively introduced into commerce. The hairy portion of the sacs is formed of a piece of the skin of a musk animal, (readily distinguished by its remarkable hairs), coarsely sown at the edges to a piece of membrane, which represents the smooth or hairless portion of the sacs. These pods are distinguished from the genuine ones by the following characters:—the absence of any aperture in the middle of the hairy coat; the hair not being arranged in a circular manner; and the absence of all remains of the penis (found in every genuine musk sac). These false sacs, as well as the genuine ones, are sometimes enveloped in papers marked, "*Musk collected in Nankin by Jung-then-chung-chung-kee.*" The odour of the musk of the false sacs is ammoniacal.

Grain musk is sometimes imitated by dried blood, and perhaps by other substances. The fraud is to be detected by a careful examination of the appearance and odour of the particles, and by their chemical characters. An infusion of genuine musk gives *no* precipitate with a solution of bichloride of mercury, but does with tincture of nutgalls, and acetate of lead. By incineration genuine musk leaves behind a greyish white ash, whereas blood yields a reddish one. *Artificial musk* is said to be prepared by rubbing in a mortar dried bullock's blood with caustic ammonia, and mixing the half-dried mass with genuine musk.

COMMERCE.—"At an average of the three years ending with 1832, the imports of musk, from all places eastward of the Cape of Good Hope, with the exception of China, amounted to 4,965 ounces a-year," (M'Culloch's *Dict. of Commerce*). In 1839, duty (6d. per ounce) was paid on 2,389 ounces.

COMPOSITION.—In 1803, Thiemann (*Berl. Jahrb.* 1803. S. 100) analysed musk. In 1805, Bucholz (Pfaff, *Mat. Med.* Bd. iv. 401) examined it. In 1820, Blondeau and Guibourt (*Journ. de Pharm.* vi. 105) published an analysis of it. Afterwards, Westler (Buchner's *Rep.* Bd. xvi. S. 222. 1824), Buchner (*Ibid.* Bd. xxii. S. 152. 1825), and Geiger and Reinmann (Gmelin, *Handb. d. Chem.* ii. 1449), submitted it to chemical investigation.

Guibourt and Blondeau.

1. *Volatilized by drying* { Water	46·925
{ Ammonia ..	0·325
2. *Extracted by ether*—Stearine, oleine, cholesterine, fatty acid with ammonia, traces of a volatile oil —.... ...	13·000
3. *Extracted subsequently by alcohol*—Cholesterine, fatty acid with ammonia, sal ammoniac, chlorides of potassium, sodium, and calcium, and an undetermined acid combined with the same bases....	6·000
4. *Extracted subsequently by water*—Gelatine, carbonaceous matter soluble in water, the preceding chlorides, and an undetermined combustible acid	19·000
5. *Extracted subsequently by ammonia*—Albumen and phosphate of lime	12·000
6. Fibrous tissue, carbonate and phosphate of lime, hairs, and sand	2·750
	100·000

Geiger and Reinmann.

1. Peculiar volatile substance. Quantity undeterminable.	
2. Ammonia	Ditto
3. Peculiar, fixed, uncrystallizable acid	Ditto
4. Stearine and oleine..........	1·1
5. Cholesterine (with some oleine and resin)	4·0
6. Peculiar bitter resin	5·0
7. Osmazome (with sal ammoniac, chlorides of sodium and calcium, and the above acid, partly free, partly combined with the bases)	7·5
8. A mouldy-like substance, in part combined with ammonia, by which it is made soluble in water, with small quantities of phosphates of lime and magnesia, sulphate of potash, chlorides of potassium and sodium, carbonate of potash or soda, and trace of iron	36·5
9. Sand	0·4
10. Water, some volatile odorous matter, the above acid in part combined with ammonia, and loss	45·5
	100·0

Odorous Principle.—Has not hitherto been isolated. The strong and diffusive odour of musk would lead us to expect that its odorous matter was highly volatile. Yet such is not the fact; for we cannot deprive musk of its peculiar odour by distillation, though the distilled liquid has a musky smell. As it is destructable by heat, it is obviously organic. It is not peculiar to musk, since many other substances exhale an analogous odour. Some have suggested that it is the result of putrefaction of one or more of the constituents of musk; and in support of this statement it is asserted that, by Leslie's method of desiccation, musk may be dried and rendered odourless. I have repeatedly performed this experiment with every care, but without obtaining odourless musk. Robiquet was of opinion that many odorous substances owed their odour to a certain quantity of ammonia, which, being disengaged, carried off with it substances not otherwise volatile, which masked the ammoniacal smell. In applying this hypothesis to musk, it must be admitted that it harmonizes well with several of the circumstances observed. Thus musk evolves ammonia; water distilled from musk contains ammonia; and potash added to a solution of musk heightens its odour (by facilitating the evolution of ammonia?).

Physiological Effects.—Musk disturbs the functions of the stomach, acts as a stimulant to the vascular system and brain, and afterwards proves narcotic. Jörg (*Material. zu einer Argneimittell. Leipzig*, 1825; and *Lond. Med. Gaz.* vol. xxvi. p. 952), and his pupils submitted themselves to its influence in doses of from 2 to 15 grains in water or mixed with magnesia. Its primitive effects were eructation, weight at the stomach, diminution or increase of appetite, dryness of the œsophagus, heaviness of the head, vertigoes, and headache. The secondary effects were more marked on the encephalon than on the digestive canal: disposition to sleep, faintness, and a feeling of heaviness in the whole body. Lastly, deep and long-continued sleep. In very large doses the action on the nervous system was very marked; trembling in the limbs, and even convulsions, were observed. The pulse was increased in frequency and somewhat fuller. These effects show that musk belongs to the cerebro-spinants (see p. 66). It is a stimulant to the nervous and vascular systems, and an irritant to the stomach. Its effects are by no means uniform. Trousseau and Pidoux (*Traité de Thérap.* t. i. p. 25), suffered from its use neither excitement of the vascular system nor sleep. Its influence is more manifested in some constitutions (those, for example, commonly termed nervous, in whom there is a very sensible or excitable condition of the nervous system), than in others (as the phlegmatic). Moreover, its effects are more marked in some morbid conditions of the cerebral functions (of the hysterical kind) than in the healthy condition of these functions. In some persons the nervous system appears to be peculiarly susceptible of the odour of musk; for it is reported that headache, giddiness, and even fainting, have been induced by it. When the digestive apparatus is previously in a state of irritation, musk increases the local disorder, giving rise to pain, nausea, vomiting, and diarrhœa. Sometimes the stimulant influence of musk is directed to the sexual organs. Trousseau and Pidoux (*op. supra cit.*) experienced from it "une assez vive excitation des organes génitaux." In the female it has occasionally provoked the catamenial discharge. In persons disposed to epistaxis it has at times appeared to bring on the hæmorrhage. Occasionally diaphoresis or diuresis has seemed to result from its use.

The odorous principle of musk is absorbed, and subsequently thrown out of the system by the excretories. Barbier (*Traité Elém de Mat. Méd.* ii. 143, 2nd ed. 1824), observes that the urine and the sweat of persons who have taken this substance are powerfully impregnated with its odour—now and then so strongly, that the hand applied, for the purpose of feeling the pulse, retains the odour for some time. On post-mortem examination, the brain, and the cavities of the chest and abdomen, in those who have taken it during life, sometimes emit a strong smell of musk. Tiedemann and Gmelin (*Vers. ü. d. Wege. auf welch. Subst. ins Blut gelang.* S. 63, 69, 71, 73. 1820), recognised the odour of musk in the blood of the mesenteric, splenic, and portal veins; but they failed to detect it in the contents of the lacteals. Trousseau and Pidoux mention that, in their experiments, the excretions acquired a feeble odour of musk. Jörg, however, denies that the excretions of those who have taken musk have the smell of this substance.

Uses.—The effects of musk, already alluded to, show that it is a remedy which will be useful where we want to excite the nervous system; and, *vice versâ*, that it will be hurtful where there exists a determination of blood to the brain, and in those constitutions denominated plethoric. The cases in which experience seems to have shown that musk is sometimes useful, are the following:—

1. Those diseases which are attended with convulsive movements, and which, therefore, are called *spasmodic*. Such, for example, as hysteria,

epilepsy (especially of children, and where the disease does not depend on organic changes, or on plethora), chorea, and even in some cases of tetanus. The employment of musk here has led to its denomination of antispasmodic.

Dr. Cullen (*Mat. Med.*), on whose practical information I place great reliance, says, "I maintain that musk (when genuine) is one of the most powerful antispasmodics that we are acquainted with. I have found it, with Dr. Wall, to be a powerful remedy in many convulsive and spasmodic affections, and in some of a very peculiar kind. I had once a gentleman affected with a spasm of the pharynx, preventing deglutition and almost respiration. This, when other remedies had failed, was relieved by the use of musk, which often shewed its power; for the disease continued to recur at times for some years after, and was only obviated or relieved by the use of musk."

2. In *low fevers* which are accompanied with delirium, twitchings of the muscles, a small contracted pulse, and convulsions, musk has been occasionally employed, and with benefit. Like opium, its use in these cases is always uncertain—in one instance relieving, in another increasing the malady, though the cases may be to all appearances parallel.

3. In *retrocedent gout*, as where gout attacks the stomach or the head, giving rise to headache or delirium, musk has been found beneficial. Cullen relates a case where immediate relief was obtained by the exhibition of fifteen grains of genuine musk.

4. In the *delirium* which sometimes occurs in pneumonia, but bear no relation to the intensity of the latter, and is accompanied with adynamia, Recamier (Jacquet, *Biblioth. Méd.* t. lix.) has found it beneficial.

5. Lastly, during the late severe visitation of *malignant cholera*, musk was one of the remedies tried. I saw it employed several times, but without obvious relief. The experience of others was various; but the result is, that the profession has formed a very low estimate of its power in this disease.

Administration.—Musk should be given in *substance*, either in the form of boluses, or suspended in water by means of saccharine or mucilaginous substances. Its dose is from eight to fifteen grains. In children it may be sometimes used in the form of enema.

1. *Mistura Moschi*, L. (Musk; Gum Arabic, powdered; Sugar, of each, ʒiij.; Rose Water, Oj. Rub the Musk with the Sugar, then with the Gum, the Rose Water being gradually added).—One fluidounce of this mixture contains nine grains of musk. In practice it will be sometimes found convenient to employ twice as much gum, and half as much again of musk. Dose, f℥j. to f℥ij.

2. *Tinctura Moschi*, D. (Musk in powder, ʒij.; Rectified Spirit, Oj. Digest for seven days, and filter).—Principally valuable as a perfume. Each f℥j. is prepared with only gr. viijss. of musk; or each fʒj. with somewhat less than one grain. It is obvious, therefore, that a dose of the tincture which contains a medium dose of musk, would be dangerous, from the large quantity of alcohol it would contain.

Essence of Musk, used as a perfume, is ordinarily prepared from the musk pods from which the grain musk has been extracted. The following formula has been furnished me, as in common use:—Grain Musk, ʒxiv. (or Musk Pods, ℥vij.); Boiling Water, Oss. Digest until cold; then add, of Rectified Spirit, Ovjss.; Carbonate of Potash, ʒss. Digest.

Cer'vus El'aphus, Linn. L. E.—*The Stag.*

(Cornu, *L.*—Horn, *E.*—Cornua Cervina Ramenta, *D.*)

HISTORY.—Both the hart and the hind (the male and female stag) are repeatedly mentioned in the Bible (ex. *Deut.* xiv. 5, and *Psalms*, xviii. 33). The stag is also noticed by Hippocrates, Aristotle, Pliny, Galen, and Avicenna.

ZOOLOGY. *GEN. CHAR.*—*Incisors* $\frac{0}{8}$, *canines* $\frac{0}{0}-\frac{0}{0}$, or $\frac{1}{0}-\frac{1}{0}$, *molars* $\frac{6}{6}-\frac{6}{6}=32$ or 34. *Canines*, when they exist, compressed and bent back. *Head* long, terminated by a muzzle. *Eyes* large, pupils elongated transversely. *A lachrymal sinus* in most. *Ears* large and pointed. *Tongue* soft. *Body* slender. Four inguinal *mammæ*. *Horns* solid, deciduous, palmated, branched, or simple, in the males; females, with one exception, without horns.

SP. CHAR.—*Horns* with three anterior antlers, all curved upwards, the summit forming a crown of snags from a common centre. *Lachrymal sinuses. Fur* red-brown in summer, brown-grey in winter. *A pale disc* on the buttocks.

FIG. 267.

Skull and Antlers of Cervus Elaphus.

a. Crown of the antlers with the velvety covering.

The stag usually begins to shed his antlers in February or March, immediately after which their reproduction begins, and by July he has completely renewed them. The first sensible phenomenon of the formation of these parts is the vascular excitement about the frontal bone. The arteries are observed to be enlarged, and to pulsate more strongly than usual; the heat is increased, and, in fact, all the symptoms of active inflammation come on. Very soon we perceive two cartilaginous tubercles, one on each side; these enlarge and elevate the skin, by which they acquire, from the distension of the latter, a velvety covering. These tubercles are soon converted into real bone; but the deposit of ossific matter does not stop here; it continues around the base of the antlers, thus giving rise to what has usually been termed the *burr*. These osseous prominences, the antlers, are supplied with two sets of vessels—an external or cutaneous, which is the most efficient, and an internal. By the pressure made on the former by the burr, they are obliterated: the covering of the antlers no longer receiving a supply of blood, soon ceases to live, dries up, and falls off. The internal vessels continue to keep up the life of the bone for a few months longer, when death takes place. This occurrence may be in part owing to the imperfect nutrition, and partly, perhaps, to the exposure of the bone to the air without any envelope; but it arises principally from some unknown changes in the vital actions. The antlers being now dead, nature soon sets about their separation. To effect this, the living parts at the base are rapidly absorbed, so that the antlers, being left but very slightly adherent to the frontal bone, readily fall off by a gentle knock. A few hours only elapse before the irregularity on the surface of the os frontis is covered by a thin pellicle, and shortly afterwards the formation of a fresh pair of antlers is commenced.

Hab.—Europe, Asia, and North of Africa.

Description and Composition.—The antlers of the stag are commonly called *hartshorn* (*cornu cervi* vel *cornu cervinum*). Though simply designated *cornu* (*horn*) in the London and Edinburgh Pharmacopœia, their composition is very different to that of the horns of the ox or the sheep, and which are sometimes called *true horn*. The latter consists principally of coagulated albumen; whereas hartshorn has the same composition as bone. According to Merat-Guillot (quoted by Berzelius, *Traité de Chim.* vii. 643) it consists of *soluble cartilage* (*gelatine*) 27·0, *phosphate of lime* 57·5, *carbonate of lime* 1·0, *water* and *loss* 14·5.

Hartshorn shavings or *raspings* (*rasura* vel *ramenta cornu cervi*) readily give out their gelatin by boiling in water.

Physiological Effects and Uses.—Decoction of hartshorn is nutritive, emollient, and demulcent. It does not possess any superiority over calf's-foot or other gelatinous liquids. It has been used in intestinal and pulmonary irritation. It is generally taken flavoured with sugar, lemon or orange juice, and a little wine.

Hartshorn shavings are directed to be used in the manufacture of *Antimonial Powder* (see p. 404), but manufacturers generally substitute bone sawings.

Brewers and others employ decoction of hartshorn for fining beer and other liquors. It is preferable to isinglass on account of its cheapness. The gelatinous matter of bones being less soluble than that of antlers, bone sawings or shavings do not answer as a substitute for hartshorn.

Cornu Ustum, L. *Pulvis Cornu Cervini Usti*, D. (Burn pieces of Horn in an open vessel until they become perfectly white; then powder and prepare them in the same manner as directed with respect to chalk). *Burnt hartshorn* is similar in its composition to bone-ash (see. p. 359). It has been used in the same cases; but its employment is now nearly obsolete. Its dose is ℈j. to ʒj.

O'vis Arĭēs, Linn. L. E. D.—*The Sheep.*

(Sevum, *L.*—Fat, *E.*—Adeps ovillus, *D.*)

History.—The sheep is one of the anciently known animals. It is mentioned by Moses (*Genesis*, iv. 2), by Herodotus (*Thalia*, cxiii.), Aristotle, and other ancient writers.

Zoology. *Gen. Char.*—*Incisors* $\frac{0}{8}$, *canines* $\frac{0}{0}-\frac{0}{0}$, *molars* $\frac{6}{6}-\frac{6}{6}$ $= 32$. *Horns* common to both sexes, sometimes wanting in the female, thick, angular, wrinkled transversely, pale coloured, turned laterally in a spiral form. *Ears* small. *Legs* slender. *Hair* of two kinds. *Tail* more or less short. Two *mammæ*.

Sp. Char. [*O. Musimon.*] *Horns* very strong, arched backwards, and curved downwards, and towards the point. General *colour* fawn, more or less brown, white on the face and legs, and under the belly; a darker streak on the dorsal line, on the flanks, and often black about the neck.

The immense number of races of this animal in cultivation are well known; and it is now difficult, perhaps impossible, to determine its native condition. Modern zoologists, however, ascribe our domesticated sheep to *Ovis Ammon*, called the *Argali* of Siberia, or to *Ovis Musimon*, termed the *Mouflon* or *Muflon* of Sardinia.

Fig. 268.

Ovis Ammon.

Fig. 269.

Ovis Musimon.

Hab.—Domesticated every where.

Description.—Mutton suet (*sevum; sevum ovillum; adeps ovillus*) is the fat from the neighbourhood of the kidneys of the animals. It is prepared (*sevum præparatum*) by melting it over a slow fire, and straining through linen or flannel in order to separate the membranous portions.

Composition.—The *ultimate* analysis of mutton suet has been made by Chevreul and by Bérard (Gmelin, *Handb. d. Chem.* ii. 439.) The first of these chemists also ascertained its *proximate* composition.

Ultimate Analyses.	*Chevreul.*	*Bérard.*	*Proximate Analysis.*
Carbon	78·996	65·0	Stearin, Elaine } principally.
Hydrogen	11·700	21·5	Margarin, a little.
Oxygen	0·304	13·5	Hircin, a little.
Mutton Suet	100·000	100·0	Mutton Suet.

Physiological Effects and Uses.—Like other fatty bodies, mutton suet is nutritious, but difficult of digestion. Its local effects are emollient and demulcent. In medicine it is used as a basis for ointments, cerates, and some plasters; being preferred, in some cases, to hog's lard on account of its greater consistence.

Bos Tau'rus, Linnæus.—*The Ox.*

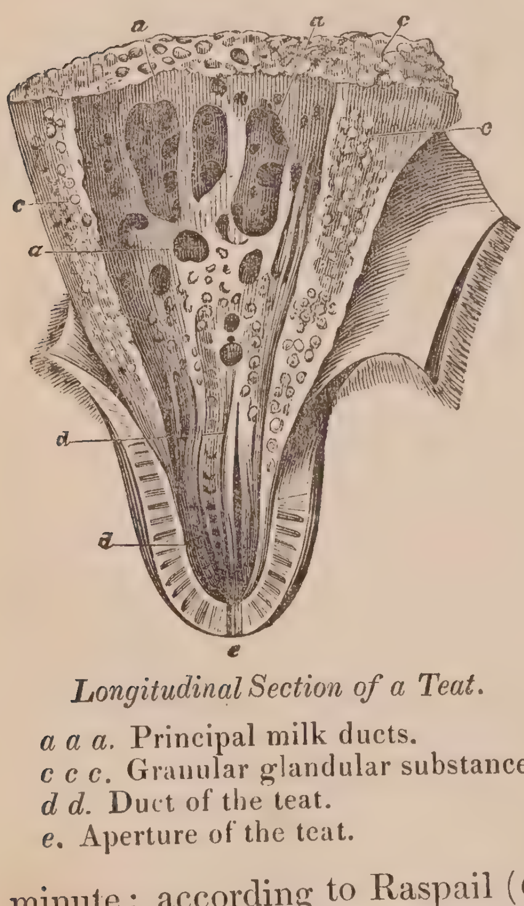
(Lac.)

History.—An animal very anciently known and highly valued. It is repeatedly mentioned by Moses.

ZOOLOGY. *GEN. CHAR.*—*Incisors* $\frac{0}{8}$, *canines* $\frac{0}{0}-\frac{0}{0}$, *molars* $\frac{6}{6}-\frac{6}{6}=32$. *Body* large. *Members* strong. *Head* large; forehead straight; muzzle square. *Eyes* large. *Ears* generally funnel-shaped. A fold of the skin, or *dew-lap* on the under-side of the neck. Four *mammæ;* tail long, tufted; horns simple, conical, round, with different inflections, but often directed laterally, and the points raised.

SP. CHAR.—*Horns* round, lateral, arched, with the point turned outwards. *Face* flat, or a little concave. *Occipital crest* in the same line as the base of the horns. *Mammæ* disposed in a square form. *Hair* fawn-coloured, brown, or black, not sensibly longer at the anterior than the posterior parts. About seven feet long.

FIG. 270.



Longitudinal Section of a Teat.

a a a. Principal milk ducts.
c c c. Granular glandular substance.
d d. Duct of the teat.
e. Aperture of the teat.

MAMMARY GLANDS two, placed close together, and constituting the *udder*. Each gland consists of a number of *lobes*, made up of *yellowish* or *reddish soft granules*, which consist of very fine blood-vessels, nerves, and the commencement of the *milk* or *lactiferous ducts* (*ductus galactophori*) which unite to form 8 or 10 principal ducts, which open into the *large duct*, or *duct of the teat*. This tube is conical, and has a number of folds on its internal surface.

HAB.—Domesticated every where.

DESCRIPTION.—Milk (*lac*), or, to be more precise in our description, *cow's milk* (*lac vaccinum*), is an opake, white, emulsive liquid, with a bland sweetish taste, a faint peculiar odour, and a sp. gr. of about 1·030: the latter property is subject to considerable variation. When recently drawn from the animal it is slightly alkaline. Subjected to a microscopical examination, milk is observed to consist of myriads of *globular particles* floating in a serous liquid. These globules are exceedingly minute; according to Raspail (*Chim. Organ.*) the diameter of the largest does not exceed in size the 0·0003937 (about 1-2500th of an inch). They instantly disappear by solution on the addition of a drop of caustic alkali. Both Donné (*Lond. Med. Gaz.* xxv. 302) and Sir A. Cooper (*On the Anatomy of the Breast*, 1840) have separated the globules by repeated filtration: the filtered liquid was transparent. The milk globules consist essentially of *butter*. Donné denies that they contain any caseum, since they are soluble both in alcohol and ether, which do not dissolve caseum. Being specifically lighter than the liquor in which they are suspended they readily separate by standing. They, therefore, rise to the surface carrying with them some caseum, and retaining some of the serum; thus forming what is called *cream*. The milk from which the cream is separated is termed *skimmed milk*.

Cream (*cremor lactis; flos lactis*) has a variable sp. gr. The average perhaps, is 1·0244. The upper stratum of cream is richest in butter the lowest in caseum. By agitation, as in the process termed *churning* the fatty globules unite to form *butter* (*butyrum*); the residue, called *butter-milk* (*lac butyratum*), consists of caseum, serum, and a little butter.

Skimmed milk, like cream, has a variable sp. gr.; perhaps the average may be taken at 1·0348. If left to itself, it readily acquires acid properties, while white coagula, commonly termed *curds*, separate from it. If an acid or rennet (an infusion of the fourth stomach of the calf) be added to it, this change is immediately effected. The curd separated by rennet is called *caseum*. But after rennet has ceased to produce any more coagula, acetic acid will cause a further quantity to be formed. The curd thus separated by the acid is termed *zieger* or *serai*. The *whey* (*serum lactis*) left after the separation of the caseum and serai, yields, on evaporation, sugar of milk, one or more nitrogenous substances, lactic acid, and some salts.

Composition.—Milk has been the subject of repeated chemical investigation (see Berzelius, *Traité de Chim.* vii. 583). The following is a recent analysis of several kinds of milk, published by MM. O. Henry and Chevallier (*Journ. de Pharm.* t. xxv. p. 340).

	Milk of the				
Constituents.	*Cow.*	*Ass.*	*Woman.*	*Goat.*	*Ewe.*
Caseum	4·48	1·82	1·52	4·02	4·50
Butter	3·13	0·11	3·55	3·32	4·20
Sugar of Milk	4·77	6·08	6·50	5·28	5·00
Various Salts	0·60	0·34	0·45	0·58	0·68
Water	87·02	91·65	87·98	86·80	85·62
Total	100·00	100·00	100·00	100·00	100·00
Solid substances	12·98	8·35	13·00	13·20	14·38

1. *Caseum* or *Casein; Albumen of Milk; Lactalbumen.*—An albuminous substance distinguished from the albumen of the egg and of blood by its not coagulating when heated, and by the products of its spontaneous decomposition. When dried it is yellowish and transparent, like gum: it is odourless, and has a very slight taste. It is soluble in water. If its solution be boiled in contact with the air it becomes covered with a white pellicle insoluble in water. The acids unite to form with it, when they are in excess, insoluble compounds. Various salts (as sulphate of copper, bichloride of mercury, nitrate of silver, bichloride of tin, &c.) form insoluble compounds with it. According to Gay-Lussac and Thénard, caseum consists of *carbon* 59·781, *hydrogen* 7·429, *nitrogen* 21·381, and *oxygen* 11·409. These numbers are about equal to $C^7 H^5 N O$.

2. *Butter.*—This well-known substance consists of three fatty bodies, *stearine, elaine*, and *butyrine*. The latter substance is characterised by yielding, by saponification, three volatile, odorous, fatty acids, viz. *butyric*, *capric*, and *caproic acids*. A small quantity of these acids exists in ordinary butter, especially when it has been exposed to the air, and gives butter its peculiar odour.

3. *Sugar of Milk; Lactin; Saccholactin.* Obtained from whey by evaporation. As used in commerce it occurs in cylindrical masses, in the axis of which is the cord which serves as the nucleus for the crystals. It is extensively made in Switzerland. It has been usually described as being incapable of undergoing the process of vinous fermentation (see p. 584); but the fact that the Tartars prepare a vinous fluid, called *Koumiss*, from mares' milk, was always an objection to the statement. Recently M. Hess (*Journ. de Pharm.* xxiii. 498) has shown that, under certain conditions, it is susceptible of fermentation. It is gritty under the teeth, and is very slightly soluble in alcohol. It is much less sweet, and less soluble in water, than common sugar. By the action of nitric acid it yields, like gum (see p. 1150), saccholactic or mucic acid; so that it forms, as it were, a connecting link between sugar and gum. It consists, according to Berzelius, of $C^5 H^4 O^0$.

4. *Lactic Acid.*—This, though stated by Berzelius to be a constituent of milk, is probably a product of its decomposition. Some chemists consider it to be a compound of acetic acid and animal matter.

5. *Salts.*—Some of these are soluble in alcohol, as the lactates (acetates?) of potash (principally) soda, ammonia, lime, and magnesia; others are soluble in water, but not

in alcohol, as sulphate of potash and the phosphate of potash and soda; lastly, the salts insoluble in water are the phosphates of lime, magnesia, and iron. The latter are held in solution in milk by the caseum principally; Berzelius says by the lactic acid also.

Characteristics of Good Milk.—The changes produced in the quality of the milk by diseased conditions of the cows has recently attracted considerable attention in Paris, owing to the prevalence of a malady, called the *cocote*, among the cows in that capital (see *Journ. de Pharm.* vol. xxv. p. 301-318). The following are the essential morbid changes which have been recognised in milk:—want of homogeneousness, imperfect mobility or liquidity, capability of becoming thick or viscid on the addition of ammonia, and presenting, when examined by the microscope, certain globules (agglutinated, tuberculated, or mulberry-like, mucous or pus globules) not found in healthy milk. Hence, then, good milk should be quite liquid and homogeneous; not viscid; and should contain only spherical transparent globules, soluble in alkalies and ether; should not become thick when mixed with ammonia; and should form a flocculent precipitate with acetic acid, but not be coagulated by heat. The relative quantity of cream afforded by milk is estimated by a graduated glass tube, called a *lactometer*.

Physiological Effects.—Milk is highly nutritive. It owes this property to the sugar, the butter, and the caseum which it contains! Being furnished by nature, as the aliment for mammals during the first period of their existence, its constituents have been taken by Dr. Prout (Elliotson's *Human Physiol.* part i. p. 65) as the basis for a division of all alimentary substances into the saccharine, the oily, and the albuminous. Perhaps the phosphate of lime found in milk ought to be considered as an aliment for young animals; inasmuch as it is necessary to the developement of their osseous system. For the most part milk is readily digestible; but with adults this is by no means universally the case. In some dyspeptics it proves heavy and difficult of digestion. I find that those with whom it disagrees are obnoxious to the use of butter, whence I infer that the injurious qualities of milk are ascribable to the oily constituent; and, with such patients, ass's milk (which contains little butter) usually agrees.

The quantity of nutritive matter contained in milk varies not only with the species but with the individual,—nay with the same individual under different circumstances. The quality of the milk is affected by constitution, age, food, period after parturition, mental emotion, disease, the use of medicines, &c.

Dr. Young (quoted by Cullen, *Mat. Med.*) found that a bitch fed on vegetable aliment yielded an acescent and spontaneously coagulable milk; but when animal food was employed, the milk was alkaline, and did not spontaneously coagulate.

Dr. Cullen says, "I allege it to be a matter of experience, that supposing the quantity of liquid to be the same, nurses living entirely, or for the greater part, upon vegetable aliment, afford a greater quantity of milk, and of a more proper quality, than nurses living upon much animal food. This I venture to assert, from the observations of fifty years."

The influence which many medicines taken by the mother have over the sucking infant, is a circumstance known to every nurse, though

Cullen denies it. We can modify the *colour* of the milk by mixing saffron or madder with the food; the *odour* may be affected by various cruciferous and alliaceous plants; the *taste* may be altered by the use of bitters, as wormwood; and lastly, the *medicinal effect* may also be influenced. Children may be salivated by sucking nurses under the influence of mercury, or purged by the exhibition of drastics, or narcotised by the administration of opiates to the nurse. These facts are so familiar to every one, that further evidence of them is scarcely requisite. It is curious, however, that Simon (*Journ. de Pharm.* xxv. 354.) failed to recognise various salts in the milk, which were found abundantly in the urine. Mental emotions also affect the quality of the milk. I have frequently seen the bowels of the child disordered in consequence of some sudden emotion on the part of the mother. It is also not improbable that diseased conditions of the parent may render the milk unhealthy. Labillardière (*Dict. Mat. Méd.* iv. 23.) states that the milk of a cow, affected with a kind of tuberculous phthisis (*pommelière*) contained seven times more phosphate of lime than usual. Dupuy, (quoted by Andral, *Treat. on Pathol. Anat.*; by Townshend and West, vol. i. p. 675) also speaks of the large quantity of calcareous matter in the milk of cows, in whose lungs abundant deposits of the same substance were found. Other morbid changes in the milk have been observed by Donné, Robiquet, and Lassaigne, and have been already alluded to. Now these are facts of the greatest moment, not only in reference to the frequency of disease in cows, and, therefore, to the possible morbific character of their milk, but it is of considerable importance in reference to the milk of the human subject. I think, with this statement before us, it is highly improper to allow a female with any trace or suspicion of tuberculous disease to suckle. Not that a few grains, more or less, of phosphate of lime in the milk, can probably do any injury to the child, but the fact once established, that the milk may be thus altered by disease, leads to the suspicion that some other substances not yet recognised by their physical or chemical characters, may be in the milk of diseased nurses, and which may have an injurious influence on the child; and the suspicion does not confine itself to those affected with tuberculous diseases: other hereditary or constitutional affections may also be attended with altered conditions of the milk. This suspicion is strengthened by the common observation that the milk of any nurses will not equally suit children. A child quite healthy, and in good condition, will sometimes, without any evident disease, fall off, and get into what is commonly called a bad condition, apparently from a change of the nurse. I am aware that we cannot always refer this to any positively hurtful matter in the milk. The quantity of nutritive matter in the same quantity of milk of two nurses, may be very different: according to Payen (*Journ. de Chim. Méd.* t. iv. p. 118), milk with too much nutritive matter in it may disagree with the child. Another point worthy of attention is the quantity of milk yielded in a given time. Payen says it varies in different women as much as from one to ten and a half.

Uses.—We take advantage of the *nutritive* qualities of milk, and employ this substance either as an article of diet or as a ready means of introducing a large quantity of nourishment into the system in a short period of time. For example, after violent uterine hæmorrhage milk is an excellent restorative. A milk diet has been strongly recommended in consumptive cases and in gout; and in some cases it has appeared to act beneficially. Its efficacy is probably rather negative than positive; that is, it is nutritive without being stimulating. Where the stomach is very irritable, ass's milk is preferable to cow's milk, on account of the small quantity of butter, and large quantity of sugar of milk which it contains.

As a *demulcent* milk is an exceedingly valuable substance in irritation of the pulmonary and digestive organs. It is an excellent sheathing agent in poisoning by caustic and acrid substances, and in some of these cases it acts as a chemical antidote; for example in poisoning by bichloride of mercury, sulphate of copper, bichloride of tin, the mineral acids, &c. Milk is further employed on account of its demulcent qualities in the preparation of the bread and milk poultice, which requires to be frequently renewed on account of the facility with which it undergoes decomposition, and acquires acrid qualities.

Milk is a constituent of the *Mistura Scammonii*, E. (see p. 888).

Whey is an excellent diluent and nutritive. *Wine whey* (*serum lactis vinosum*) taken warm, and combined with a sudorific regimen, acts powerfully on the skin, and is a valuable domestic remedy in slight colds and febrile disorders. I have already referred to the uses of *cream of tartar whey* (see p. 306), *alum whey* (see p. 373), and *tamarind whey* (see p. 1161).

Gelatine (*Gelatina*) is extracted from the bones of the ox and the sheep. It is obtained by boiling bones in water under pressure. It is more readily procured by employing bones which have been previously digested in hydrochloric acid to extract the phosphate of lime. In this way a nutritious soup is prepared in Paris, for the hospitals and other pauper habitations. (Consult M. Edwards' *Recherch. Statist. sur l'Emploi de la Gelatine*, Paris, 1835). The *patent gelatine* of the shops is obtained, I presume, from bones. It is sold either plain or coloured; and is used as a substitute for isinglass. Gelatine has been extracted from antediluvian bones. A soup was prepared from the bones of the great mastodon by a Prefet of one of the departments of France. Gelatine is useful in medicine as a nutritive substance, as a chemical test, as an adhesive matter (ex. black sticking plaster), as a fining for some liquids, and to form a soluble envelope for nauseous medicines (see gelatine capsules, p. 1179). Seguin (see p. 992) used it as a febrifuge. (For some remarks on the best method of extracting the nutritious portion of bone, and its economical application, see *Quart. Journ. of Science*, April, 1827).

Ox Bile (*Fel Bovinum* seu *Tauri*). Formerly extract of ox bile (*fel tauri inspissatum*) was employed in medicine as a tonic. It consists of *biliary matter, mucus, alimentary extract, chloride of sodium, lactate* and *phosphate of soda, and phosphate of lime*. The dose of it is a few grains in the form of pills.

Order 3. Pachydermata, *Cuvier*.

Three kinds of *teeth*. Four *extremities*, with the toes variable in number, and furnished with strong *nails* or *hoofs*. No *clavicles*. *Organs of digestion* not disposed for ruminating.

Sus Scro'fa, Linn. L. E. D.—*The Hog*.

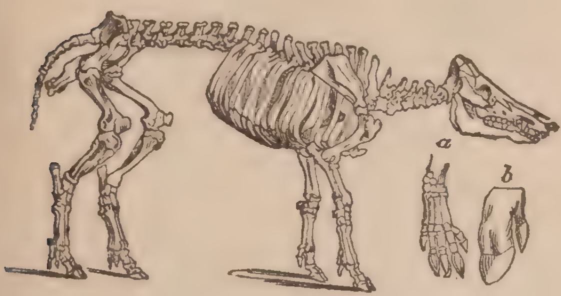
(Adeps præparatus, *L.*—Fat, *E.*—Adeps ovillus, *D.*)

History.—The hog is an animal very anciently known. By the Levitical law the Jews were forbidden to eat its flesh, (*Levit.* xi. 7); on account of either the filthy habits of the animal, or its supposed tendency to engender skin and other diseases, more especially leprosy. The Mahometans are also interdicted from eating it.

ZOOLOGY. *GEN. CHAR.*—*Incisors*, $\frac{4}{6}$ or $\frac{6}{6}$; *canines*, $\frac{1}{1}-\frac{1}{1}$; *molars*, $\frac{7}{7}-\frac{7}{7}$; $=42$ or 44. *Canines* bent upwards and laterally; *molars* tuberculous; lower *incisors* bent forwards. Four *toes* on all the feet, the two middle ones only touching the ground, armed with strong *hoofs*. *Nose* elongated, cartilaginous. *Body* covered with bristles. Twelve *teats*.

SP. CHAR.—*Tusks* strong, triangular, directed laterally. No *protuberance* under the eyes. *Colour* blackish-gray in the wild animal, but varying much in the domesticated races.

FIG. 271.



Skeleton of Sus Scrofa.

a. Foot with five hoofs.
b. Undivided hoof.

The varieties of this animal are almost innumerable. They are most conveniently reduced to the following:—

α. *S. Scrofa ferus.* The *wild hog*, or *wild boar*.

β, *S. Scrofa domesticus.* The *domesticated hog*, which varies in its form and colour.

γ. *S. Scrofa pedibus monungulis.* The hog with solid and undivided hoofs. This variety was noticed by Aristotle and Pliny.

HAB.—The temperate parts of Europe and Asia; the northern parts of Africa; America; the Islands of the South Sea, &c.

PREPARATION.—The fat of the animal is employed in medicine. That about the loins being firmer and denser than the fat of the other parts of the animal, is selected for medicinal use. In order to separate it from the membranes in which it is contained, it is melted over a slow fire, then strained through flannel or linen, and poured while liquid into a bladder, where it solidifies by cooling. Occasionally salt is added to preserve it; but unsalted lard should be employed for medical purposes. By melting in boiling water, lard may be deprived of any salt which may have been mixed with it. While solidifying, lard should be kept stirred, to prevent the separation of the stearine and elaine.

PROPERTIES.—*Hog's lard* (*adeps suillus* vel *porci*) or *axunge* (*axungia*, so called from the use anciently made of it, namely, greasing the axle of a wheel,—*unguendi axem*) is at ordinary temperatures a white or yellowish white solid. Its melting point varies from 78·5 F. to 87·5° F. In the liquid state it should be perfectly clear and transparent; but if it be intermixed with water it has a whitish or milky appearance. It should have little or no taste or odour. By exposure to the air, however, it acquires an unpleasant odour and acid properties. In this state it is said to be *rancid*. This condition is induced by the oxygen of the air, part of which is absorbed, while a small portion of carbonic acid is evolved. As stearine does not become rancid in the air, while elaine does, the rancidity of lard is referred to the latter constituent. But it has been found that the purer the elaine the less readily does this change occur; whence it is assumed that some foreign substance in the elaine is the primary cause of rancidity, either by undergoing decomposition or by acting on the elaine.

COMPOSITION.—The *ultimate* composition of lard was ascertained by Chevreul (Gmelin, *Handb. d. Chem.* ii.), as well as by Saussure and Berard. The first of these chemists also made a *proximate* analysis of rancid lard; and Braconnot determined the composition of fresh lard.

Ultimate Analysis.

	Chevreul.
Carbon	79·098
Hydrogen	11·146
Oxygen	9·756
Lard	100·000

Proximate Analysis of Fresh Lard.

	Braconnot.
Stearine } Margarine }	38
Elaine	62
Lard	100

Proximate Analysis of Rancid Lard.

Chevreul.

Stearine and Elaine.
Volatile non-acid matter having a rancid odour.
Caproic (?) acid.
Another volatile acid.
Oleic, margaric, and perhaps stearic acids.
Yellow colouring matter.
Non-acid, non-volatile matter, soluble in water.

Rancid lard.

Physiological Effects.—Lard, like other animal fats, is nutritious, but very difficult of digestion. Its topical effects are demulcent and emollient. Both the flesh and fat of the hog have been long supposed to dispose to cutaneous disease; but it is no easy matter either to prove or disprove this opinion.

Uses.—In medicine lard is principally employed as a basis for unguents. It has been used, by friction, as an emollient; but the practice is now obsolete. In pauper establishments it is sometimes employed, as a substitute for spermaceti ointment, to dress blisters; but the salt which lard sometimes contains, as well as the facility with which this fat becomes rancid, are objections to its use. I have seen it occasion considerable irritation.

Order 4. Rodentia, *Cuvier.*

Glires, *Linnæus.*

Two large *incisors* in each jaw, separated from the molars by a vacant space. No canine teeth. *Molars* with flat crowns or blunt tubercles. *Extremities*, the posterior longest, terminated by unguiculated *toes*, the number varying according to the species. *Mammæ* variable in number. *Stomach* empty. *Intestines* very long.

Cas'tor Fi'ber Linn. L. E. D.—*The Beaver.*

(Concretum in folliculis præputii repertum, *L.*—A peculiar secretion from the præputial follicles, *E.*—Castoreum, *D.*)

History.—Castoreum was employed in medicine by Hippocrates, who considered it to possess the power of acting on the uterus. It was an ancient opinion that the castor sacs were testicles, and that when closely pursued by the hunter, the animal tore them off, leaving them behind him as a ransom (Juvenal, *Sat.* xii. v. 34). Hence, it was said, arose the name of the animal, *à castrando.* This absurd notion seems to have been long ago disbelieved; for Pliny (*Hist. Nat.* lib. xxxii. cap. 13 ed. Valp. (tells us that Sextius derided it, and said that it was impossible the animal could bite them off, since they were fastened to the spine. Thus was one error confuted by another; the truth being, the testicles are so placed in the inguinal region, on the external and lateral part of the *os pubis*, that they are not discernible until the skin be removed. Moreover, female beavers also have castor sacs.

Zoology.—*Gen. Char.*—Incisors $\frac{2}{2}$, canines $\frac{0}{0}-\frac{0}{0}$, molars $\frac{4}{4}-\frac{4}{4}=20$. *Molars* composed of flat crowns, with sinuous and complicated ridges of enamel. Five *toes* on each foot, the anterior short and close, the posterior longer and palmated. *Tail* broad, thick, flattened horizontally, of an oval form, naked, and covered with scales (Stark).

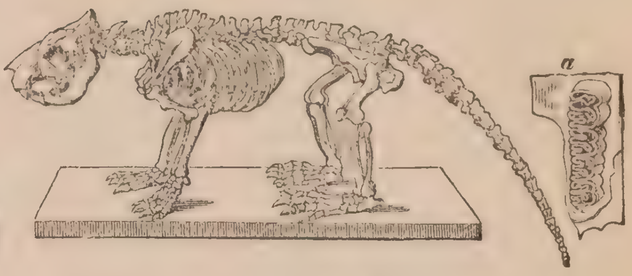
Sp. Char.—*Fur* consisting of two sorts of hair, one coarse and brownish, the other downy, more or less gray. About two feet long.

Fig. 272.

Castor Fiber.

b. Scales of the tail.

Fig. 273.



Skeleton of the Castor Fiber.

a. Molars of the upper jaw.

The ordinary *colour* of the animal is brown; but yellow, black, spotted, and white beavers are met with. The two latter are very rare. Richardson (*Fauna Boreali-Americana*,) has never seen either of them, though he has met with black beavers which were kept as curiosities. The *tail* is remarkable for its scaly appearance. Its great breadth (oftentimes 5 inches) depends, not on the width of the caudal vertebræ, but on numerous strong tendons inserted into these vertebræ. *Incisor teeth*, smooth, orange-coloured anteriorly, white posteriorly.

There is some reason for supposing that the European and American beavers are distinct species. The former are *burrowers*, the latter *builders*.

Anatomy of the Castor Sacs.—It has been before stated, that both male and female beavers are furnished with castor sacs: hence it will be convenient to consider them in the two sexes separately.

1. *Of the Male Castor Sac.*—If the animal be placed on his back, we observe, near the tail, a hollow (called by some a *cloaca*) inclosed by a large wrinkled, somewhat hairy, cutaneous protuberance, which according to Perrault (*Mem. for a Nat. His. of Animals*, p. 85. Lond. 1701,) is easily contracted and dilated, not by a sphincter as the anus, but simply like a slit. In this hollow the anus, the prepuce, and the oil sacs open.

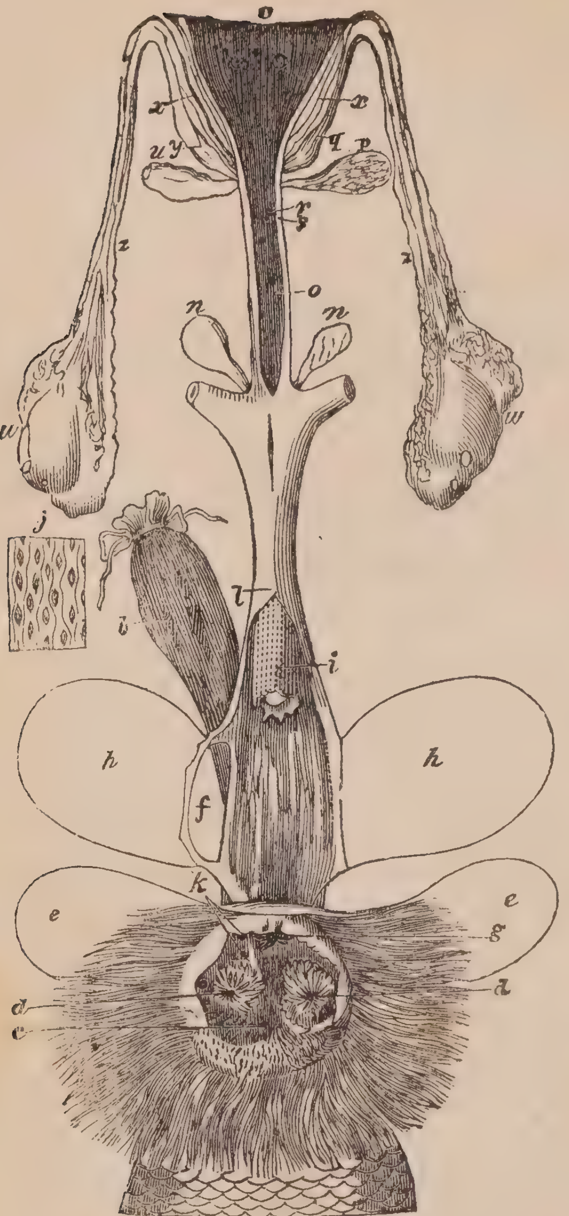
When the skin of the abdomen is removed, four eminences, covered by their appropriate muscles, are brought into view. They are placed between the pubic arch and the so-called cloaca. The two nearest the pubes are the *castor sacs*, while those next the cloaca are the *oil sacs*. Between the two castor sacs, in the male, lies the *penis* with its bone (*os penis*); it is lodged in a long *preputial canal*, which terminates in the cloaca, and has some analogy to a vagina; so that there is some difficulty to determine, until the skin be removed, whether the individual be male or female.

Fig. 274.

Os penis of the Castor Fiber.

The penis points towards the tail, not towards the navel, as in the dog. Its surface is covered with longitudinal wrinkles and pits: in each of the latter is found a dark-coloured warty-like body. The *testicles*, *vasa deferentia*, and *vesiculæ seminales*, present nothing remarkable. There is no *scrotum*. Like most other Rodentia, the beaver has *vesiculæ accessoriæ*, or blind ducts, which open into the urethra near its commencement. Just at the point where the urethra joins the penis are observed *Cowper's glands*. The *castor sacs* open by a common aperture into the preputial canal. This aperture is about one inch in width, and is placed opposite the extremity of the *glans penis* in the relaxed condition of the organ, and about one inch from the orifice of the prepuce. Between this common orifice of the castor sacs and the glans penis is a semilunar fold. There is also a second, similar, but thicker, fold covering the rectum. The *castor sacs* are pyriform and compressed. They communicate with each other at their cervical portion; but their fundi

Fig. 275.



Sexual organ of a male beaver.

a, Under portion of the tail.
b, Rectum.
c, Anus.
d d and *k*, Openings of the anal glands.
e e, Anal glands.
f, Common opening of the two castor sacs.
h h, The castor sacs.
i, Glans penis.
j, Magnified view of a portion of the epidermis of the glans.
l, Penis.
n n, Cowper's glands.
o, Urethra laid open.
p, Left vesicula seminalis.
q, Left vas deferens.
r, Opening of the left vesicula seminalis.
s, Opening of the left vas deferens.
u, Right vesicula seminalis.
v, Portion of the bladder, showing the opening of the ureters.
w w, Tesicles.
x x, Vesiculæ accessoriæ.
y, Right vas deferens.
z, Spermatic cord.

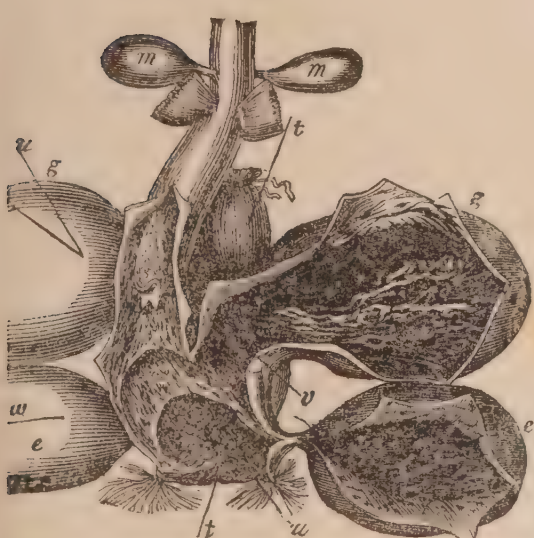
Fig. 276.

Castor and oil sacs with their appropriate muscles.

a, Spermatic vessels.
c, Anus.
d d, Openings of the anal glands.
e e, Anal glands.
g g, Castor sacs.
h, *i*, *l l*, *n*, Compressor muscles of the castor sacs and anal glands.
k, Penis.
m m, Cowper's glands.
o, Urethra cut off.
p, Lobes of the prostate gland.
r, Testicle.
The figures refer to the probes passing from the caput gallinaginis to the vesiculæ seminales and vasa deferentia.

diverge outwards and towards the pubes. Each castor sac is composed of an *external* or *cellular* coat which incloses *muscular fibres.* The latter are a continuation of the panniculus carnosus: their function appears to be to compress the sac. Within these fibres lies a very *vascular coat,* which covers the scaly or glandular coat, and sends processes in between the convolutions of the latter The *scaly or glandular coat* forms numerous folds or convolutions, which are largest and most numerous in the fundus of the sac. Externally, it is shining, silvery, and iridescent. Internally, it presents numerous, small, lanceolate, oblong, or semilunar scales, which are mostly toothed at their margin, and envelope each a *brown body,* supposed to be a gland, and which is lodged in a small cavity. The inner surface of the castor sacs is lined with *epithelium* (a continuation of the epithelium of the prepuce), which invests the glands and scales of the scaly or glandular coat. In the cavity of the castor sac is found the *castoreum,* which, when recent, is thin, fluid, highly odorous, yellow or orange coloured, becoming deeper by exposure to the air. The quantity of this secretion is liable to great variation. The *oil sacs* are conglomerate glands, placed one on each side between the castor sac and anus: their ducts terminate in the cloaca. The secretion of these sacs is a fatty matter, having the consistence of syrup or honey, a peculiar odour, and a yellowish colour. It was formerly used in medicine under the name of *pinguedo* seu *axungia castoris.* (For further details respecting the structure of the castor sacs consult Brandt and Ratzeburg, *Med. Zool.* i.)

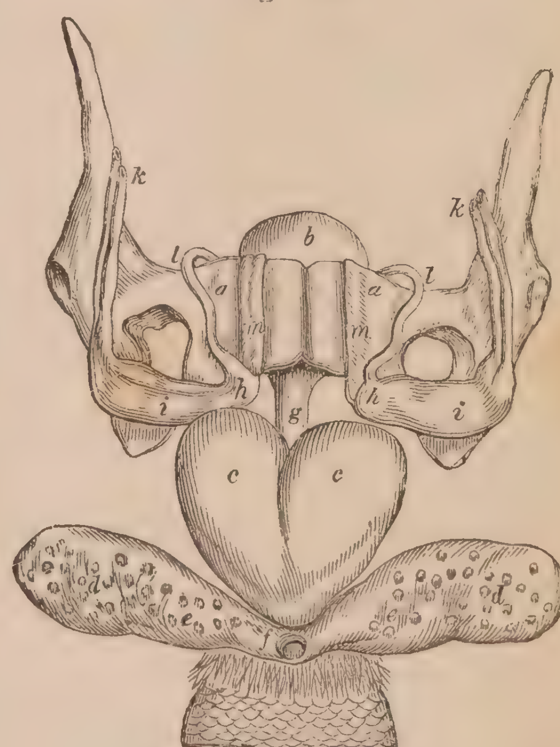
Fig. 277.



Castor and oil sacs laid open.

e e, Anal glands.
g g, Castor sacs.
m m, Cowper's glands.
t t, Probe passing into the rectum beneath a semilunar fold which separates the common aperture of the castor sacs from the penis.
u u and *v v,* Two probes passing into the right castor sac, behind a second semilunar fold.

Fig. 278.



Relative position of the castor and oil sacs and pelvis.

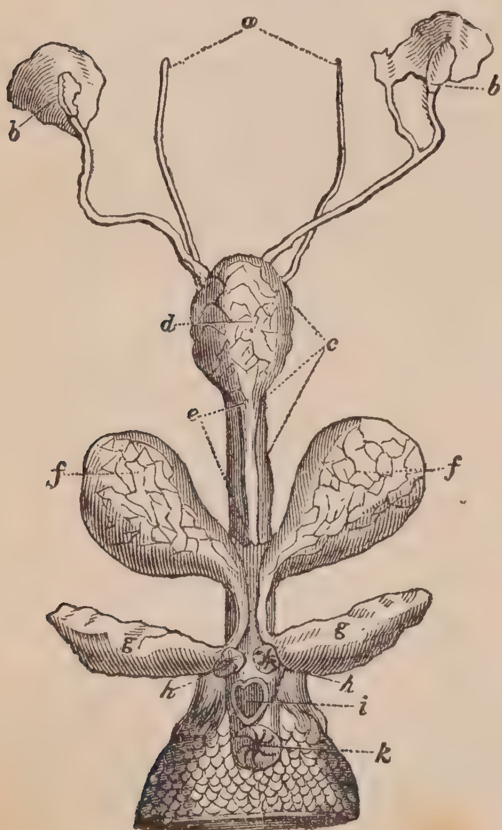
a a, Os pubis.
b, Bladder.
c c. Castor sacs.
d d, Oil sacs.
f, The false cloaca.
g, The commencement of the penis.
h h, The epididymides.
i i, The testicles.
k k, The spermatic cord.
l l, The vasa deferentia.
m m, The cremaster muscles.

The relative position of the castor and oil sacs, with respect to the pelvis of the animals, is shewn in fig. 278, taken from Perrault (*op. supra cit.*)

2. *Of the Female Castor Sac.*—We are less perfectly acquainted with the anatomy of the female than of the male beaver. Indeed I am acquainted with three

dissections only of the former; viz. one by Gottwaldt, a second by Hegse (both referred to by Ratzeburg, *op. supra cit.*), and a third by Mortimer (*Phil. Trans.* vol. xxxviij. 1735). The subjoined description and figure is from the memoir of the last-mentioned authority.

FIG. 279.



Sexual organs of a female beaver.

a. The two ureters.
b b. The ovaria.
c. The uterus lying under the bladder.
d. The bladder contracted and empty of urine.
e. The meatus urinarius, above two inches long.
f f. The castor sacs.
g g. The oil sacs.
h h. Common orifices of the castor ducts and oil sacs.
i. The vagina cut off.
k. The anus.
l. Part of the tail.

He says the animal had two *ovaria*, and an *uterus* dividing into two horns (uterus bicornis), as in the bitch. The *bladder* lay exactly over the body of the uterus. The *meatus urinarius* ran upon the *vagina* above two inches in length. Just below the *os pubis*, on each side of the vagina, above the meatus urinarius (supposing the animal laid on her back), a pair of *pyriform bags* were found, about 1¾ inches long, and 1 inch broad diverging at their fundi or broad ends, but approximating almost closely at their necks or narrow extremities, which were canals communicating with the adjoining glands. The membranes which formed these bags were tough, wrinkled, and furrowed, of a livid dirty colour. They were hollow, and capable of containing about an ounce of water. Upon opening them a small quantity of dark-brown liquor, like tar, was found, having an odour like castoreum, and in addition a smell of ammonia. It is probable the emptiness of the sacs, and the unusual quality of their contents, arose from the youth of the animal. About an inch lower, on each side of the vagina, were a pair of *glands (oil sacs)*, each about 1½ inches long, and ½ inch broad. Their form was oblong, but irregular, and having several protuberances externally; their colour was pale flesh, like the pancreas. They seemed to communicate with the castor sacs, the sac and gland on each side opening externally by one common orifice, around which were long black hairs.

Hab. — North America, from 67° or 68° to about 33° north latitude; Europe, from 67° to 36° north latitude, but becoming very scarce. It appears to have been indigenous.

CAPTURE OF THE BEAVER.—The beavers are caught in various ways; sometimes in traps, sometimes in nets. But the usual method is to break up the beaver houses when the animals retreat to their bank holes, in which they are easily taken.

COMMERCE.—Castoreum is imported from North America by the Hudson's Bay Company. The greater part of that brought over is sold for exportation. In 1839 duty (6d. per lb.) was paid on 801lbs.

DESCRIPTION.—Two kinds of castor (*castoreum*) have long been known, viz. Russian and American. The latter, however, is the only one now met with in English commerce.

1. *AMERICAN CASTOR.* (*Castoreum Americanum.*)—It usually consists of two isolated sacs, frequently wrinkled, and which are connected so as to form two parts, like a purse, or like two testicles connected by the

spermatic cords. The size of the sacs is liable to considerable variation. They are elongated and pyriform. The penis or the oil sacs, or both, are sometimes attached to them. The colour and other external characters are variable. In December, 1834, I examined between three and four thousand pounds of castoreum, which was offered for sale by the Hudson's Bay Company. A considerable quantity of it was covered externally with a bluish white mouldiness, while the remainder was of a brownish colour. The brown colour, however, varied considerably; sometimes being dark, in some cases yellowish, or even reddish. Some castor sacs are found nearly empty, and present, in their dried state, a very fibrous character: these are of inferior quality. Others are found gorged with unctuous matter, and, when quite dry, break with a resinous character, presenting no fibres until they have been macerated in spirit of wine. In many well-filled sacs the castoreum is quite soft.

In English commerce, two varieties of American castoreum are made: one called the *Hudson's Bay*, the other the *Canadian*. Both are imported by the Hudson's Bay Company. The *Hudson's Bay castoreum* is usually considered the finest variety. The specimens of it which I examined at the house of the Company, in December, 1834, came from York Fort, and Moose River. The finest samples were superior to any of the Canadian kind, though the average quality was much the same.

2. *Russian Castor.* (*Castoreum Rossicum*).—This is exceedingly scarce. When met with it fetches a very high price. I have paid for a museum sample £2 per oz., while American castor fetched only twenty shillings per lb. There are at least three kinds of castor sold as Russian. *Chalky Russian castor* occurs in smaller and more rounded sacs than the American kind (see *Lond. Med. Gaz.* vol. xvii. p. 296, fig. 41). A pair of sacs in my museum weighs 557 grains. The specimens which I have seen had neither penis nor oil sacs attached. The colour is ash-brown. Its odour is peculiar, empyreumatic, and readily distinguishable from that of the American kind. Under the teeth it breaks down like starch, has at first little taste, then becomes bitter and aromatic. It is readily distinguished from all other kinds by dropping it into diluted hydrochloric acid, when it effervesces like a lump of marble. I have seen another kind of castor from Russia which may be termed *Resinous Russian Castor*. The sacs were large, well-filled with resin, did not effervesce with hydro-chloric acid, and had an odour very similar to that of American castor. The *Russian castor described by Guibourt* (*Journ. de Chim. Méd.* t. viii. p. 602) appears to have been subjected to some preparation (see *Lond. Med. Gaz.* vol. xvii. p. 297, fig. 42.)

Composition.—Castoreum has been subjected to chemical analysis by several chemists. Those whose results deserve especial reference are Bonn (quoted by Gmelin, *Hand. d. Chem.* ii. 1449) and Brandes (quoted by T. W. C. Martius, *Lehrb. d. pharm. Zool.* 19, and 27).

Brandes's Analyses.

Volatile oil	1·0
Resin	13·85
Castorin	1·05
Albumen	0·05
Osmazome	0·20
Carbonate of lime	33·60
Other salts	2·82
Mucus	2·30
Animal matter like horn	2·30
Membrane	19·20
Moisture and loss	22·93
Canadian Castor	100·00

Volatile oil	2·0
Resin	58·6
Cholesterine	1.2
Castorin	2·5
Albumen	1·6
Gelatine	10·4
Osmazome	2·4
Matter soluble in alcohol	1·6
Carbonate of lime	2·6
Other salts	2·4
Membrane	3·0
Moisture and loss	11·7
Russian Castor	100·0

These analyses do not agree with my experiments and observations. The quantity of carbonate of lime assigned to Canadian castor is much too large. By incinerating 60 grains of good American castor in a platinum crucible I found only 1·2 grs. of ashes, which if the whole were lime would be equal to little more than 3·57 per cent. of chalk.

1. *Volatile Oil of Castoreum.*—This is obtained by distilling the same water several times with fresh portions of castor. It is pale yellow, and has the odour of castor, with an acrid bitter taste. Bonn says he obtained 34 per cent. of oil, but there must be some error in this statement.

2. *Castorine; Castoreum Camphor*, Gmelin.—A crystalline, fatty, non-saponifiable substance. It is fusible, and in the liquid state floats on water. When pure it is quite white. It is soluble in ether and boiling alcohol. By long ebullition with nitric acid, it is converted into a yellow crystallizable acid, called *castoric acid*. The supercastorate of ammonia is crystallizable, and forms white precipitates with the salts of silver, lead, and protoxide of iron, and green precipitate with the salts of copper. Castorine is obtained by boiling castor in alcohol; the castorine deposits when the liquor cools. Scarcely any can be got from American castor.

3. *Resin.* This is dark brown, has an acrid and bitter taste, and a slight odour of castor. It is insoluble in pure ether, but dissolves readily in alcohol. Water precipitates it from its alcoholic solution.

Physiological Effects.—Castor is usually denominated a stimulant and antispasmodic. Since the time of Hippocrates it has been regarded as endowed with a specific influence over the uterus.

In 1768, Mr. Alexander (*Experimen. Essays*, p. 83) took it in various doses to the extent of two drachms; and the only effect he experienced from it was disagreeable eructations. In 1824, Jörg and his pupils, males and females (*Material. zu einer kunft. Arzneimittell.* Leipzig, 1824, *Lond. Med. Gaz.* vol. xxvi. p. 952) submitted themselves to its influence; but the only effects were a slight uneasiness in the epigastric region, and disagreeable eructations having the odour of castor, and which were not allayed by breakfast or dinner, and only ceased at night when sleep came on.

These facts seem to shew that castoreum possesses but little medicinal power: yet Dr. Cullen (*Mat. Med.*) declares that on many occasions it is certainly a very powerful antispasmodic. Its odorous particles become absorbed, for they have been recognized in the urine by their smell.

Uses.—Castoreum was formerly in great repute in those affections of the nervous system denominated *spasmodic*, such as hysteria, epilepsy, and catalepsy, more especially when these diseases occurred in females, and were attended with uterine disorder. In those kinds of fever called *nervous*, this medicine has also been recommended. In the northern parts of Europe it is used for its supposed *uterine influence*, as, to promote the lochial discharge, and the expulsion of retained placentæ. It is, however, little employed here, partly, perhaps, in consequence of its disagreeable taste and smell, its variable quality, and its high price; but, for the most part, I believe, because practitioners consider it an almost inert remedy.

Administration.—It is best given in substance, either reduced to powder or in the form of pills. The dose should be at least ℈ij.

1. *Tinctura Castorei*, L. E. (*Tinctura Castorei Rossici*, D.) (Castor [Russian, *D.*], bruised, ℈ijss. [℥jss. *E.*, ℈ij. *D.*]; Rectified Spirit, Oij. [f℥xvj. *E.*, Proof Spirit, Oij. wine measure, *D.*] Macerate for fourteen [seven, *D.*) days, and filter. "This tincture may be prepared either by digestion or percolation, like the tincture of Cassia" [p. 788], *E.*)—Rectified spirit, used by the London and Edinburgh Colleges, is a better solvent for castor than proof spirit, employed by the Dublin College. The quantity of castor used in all the processes is much too small. A fluidounce of the Edinburgh tincture contains three-fourths of a drachm, while the London preparation contains only half a drachm; so that to give a medium dose of castor (℈j.), it would be necessary to administer f℥ij. of the tincture (rectified spirit) of the London Pharmacopœia! Dr. Paris (*Pharmacol.*) says the dose of this tincture is ♏xx. to f℈ij.

2. *Tinctura Castorei Ammoniata*, E. (Castor, bruised, ℥j.; Asafœtida, in small fragments, ℈ss.; Spirit of Ammonia, f℥xvj. Digest for seven days in a well-closed vessel; strain and express strongly the residuum; and filter the liquor. "This tincture cannot be so conveniently prepared by the method of percolation," *E.*)—Stimulant and antispasmodic. Spirit of Ammonia is a good solvent for both castor and asafœtida. Dose f℈ss. to f℈ij.

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ADDENDA ET CORRIGENDA.

PART I.

Page, line.
156, 19, *for* 63·7, *read* 36·7.
182, 16, *for* ℥ss. *read* ʒss.
208, 6, *for* Hydrogen 1, *read* Hydrogen 5.
208, 12, *for* 198, *read* 196.
226, 38, *for* two, *read* ten.
254, 20, *for* 1½, *read* 2½.
256, 14, *for* sulphur, *read* metals.
263, 6, *transpose the words* loses *and* gains.
286, 11, *after* pour in, *add* ℥ij. and ʒj.
333, 19, *for* Galls, *read* Gauls.

Page, line.
396, 12, *for* one-sixteenth, *read* one-ninth.
405, in table.—The figures 57, 56·0, and 66, should stand opposite to Antimonious acid (instead of sesquioxide of antimony); and 43, 42·2, and 33, opposite to Subphosphate of lime (instead of antimonious acid).
481, 40, *for* ten, *read* five.
506, 36, *for* lead mills in Lancashire, *read* lead hills in Lanarkshire.
527, *dele* lines 18, 19 ("The zinc—sulphate.")
545, 10, *for* sesquioxdide, *read* sesquiodide."

Preparations omitted.

At p. 330.—TROCHISCI SODÆ BICARBONATIS, E.—(Bicarbonate of Soda, ℥j.; Pure Sugar, ℥iij.; Gum Arabic, ℥ss. Pulverize them, and then, with mucilage, beat them into a proper mass for making lozenges.)

At p. 359.—TROCHISCI CRÆTÆ, E.—(Prepared Chalk, ℥iv.; Gum Arabic, ℥j.; Nutmeg, ʒj.; Pure Sugar, ℥vj. Reduce them to powder, and beat them, with a little water, into a proper mass for making lozenges.)

At p. 364.—TROCHISCI MAGNESIÆ, E.—(Carbonate of Magnesia, ℥vj.; Pure Sugar, ℥iij. Nutmeg, ℈j. Pulverize them, and, with mucilage of Tragacanth, beat them into a proper mass for making lozenges.)

At p. 367, bottom line, *add*—" PULVIS SALINUS COMPOSITUS, E.—(Pure Muriate of Soda and Sulphate of Magnesia, [of each] ℥iv.; Sulphate of Potash, ℥iij. Dry the salts separately with a gentle heat, and pulverize each; then triturate them well together, and preserve the mixture in well-closed vessels.") Cooling laxative. Employed in habitual costiveness. Dose, a tea-spoonful in half a pint of water before breakfast.

PART II.

562, 15, *for* marinus, *read* marina.
783, 39, *insert* after the word "imported," the following:—"in bales of 3 feet 6 inches long enveloped in coarse cloth, called gunny. In the shops it is frequently made up"
785, 26, *insert* after the word "made," the following:—"*Pulvis aromaticus*, E.D.—Cinnamon; Cardamom Seeds; Ginger, of each equal parts, *E.*—Cinnamon, ʒij.; Cardamom Seeds; Ginger, of each ʒj.; Long Pepper, ʒj. *D.*"
807, 8, *for* Lauraceæ, *read* Thymelaceæ.
967, 13, *insert*—"TROCHISCI LACTUCARII, E.—(Prepared with Lactucarium in the same proportion and in the same manner as the opium-lozenge.
1220, 43, *insert*—"TROCHISCI ACIDI TARTARICI, E.—(Tartaric Acid, ʒij.; Pure Sugar ℥viij.; Volatile Oil of Lemons, ♏x. Pulverize the sugar and acid, add the oil, mix them thoroughly, and, with mucilage, beat them into a proper mass for making lozenges.
1227, line 8 of explanation of woodcut, *for* sides, *read* seeds.

THE END.

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